A COMPARATIVE STUDY OF DEXMEDETOMIDINE AND LABETALOL FOR ATTENUATION OF HAEMODYNAMIC STRESS RESPONSE TO LARYNGOSCOPY AND INTUBATION

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(Anaesthesiology)

MADRAS MEDICAL COLLEGE
THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY
CHENNAI

APRIL 2012

CERTIFICATE

This is to certify that this dissertation entitled "**A COMPARATIVE STUDY OF DEXMEDETOMIDINE AND LABETALOL FOR ATTENUATION OF HAEMODYNAMIC STRESS RESPONSE TO LARYNGOSCOPY AND INTUBATION"** is a bonafide record of the work done by **Dr.A.SANGEETHA** under my supervision and guidance in the Institute of Anesthesiology and Critical care at Madras Medical College Hospital, Chennai, during the period of her postgraduate study from **May - 2010 to April- 2012** for the partial fulfillment of M.D. (Branch – X Anesthesiology) degree.

THE DEAN,
MADRAS MEDICAL COLLEGE,
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THE DIRECTOR ,
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DECLARATION

I, **Dr.A.SANGEETHA** declare that the dissertation titled **"A COMPARATIVE STUDY OF DEXMEDETOMIDINE AND LABETALOL FOR ATTENUATION OF HAEMODYNAMIC STRESS RESPONSE TO LARYNGOSCOPY AND INTUBATION"** has been prepared by me. This is submitted to The Tamil Nadu Dr. M.G.R. Medical University, Chennai, in partial fulfillment of the requirement for the award of M.D. Degree, Branch X (ANAESTHESIOLOGY) degree Examination to be held in APRIL 2012.

PLACE : Chennai

DATE : **(A.SANGEETHA)**

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ABBREVIATIONS

ECG	-	Electro cardiogram
IHD	-	Ischarmic Heart disease
MAP	-	Mean Arterial Pressure
SA Node	-	Sino Atrial Node
GABA	-	Gamma Amino Butric Acid
CSF	-	Cerebrospinal Fluid
SAP	-	Systolic Arterial Pressure
DAP	-	Diastolic Arterial Pressure
HR	-	Heart Rate
SPO_2	-	Oxygen Saturation
SVR	-	Systemic Vascular Resistance
MMS	-	Modified Mallampatti Score
CLG	-	Cormack Lehne Grading
NIBP	-	Non Invasive Blood Pressure
ASA	-	American Society of Anaethesiologist

CONTENTS

INTRODUCTION

Control of airway is one of the defining moments of Anaesthesia.

Before the twentieth century, intubation of the trachea had been described and performed rather crudely, often using fingers as a makeshift laryngoscope without using any pharmacological agents. At that time the only regular intubation of the trachea that was taking place was in the resuscitation of asphyxiated neonate.

In 1880, Sir William Macevenˈ[1] a Scottish surgeon was the first to perform endotracheal intubation.

In 1895 Kirstein became the first to perform endotracheal intubation using a laryngoscope.

The credit of developing the scientific principles of direct laryngoscopy and endotracheal intubation belongs to the American otolaryngologist Dr. Chevallier Jackson.

In 1913-jackson devised a U-shaped laryngoscope.

In 1913-Janeway introduced L-shaped laryngoscope with batteries in the handle.

Now we use rigid direct laryngoscopes to view the larynx and adjacent structures under direct vision for the purpose of endotracheal intubation. This causes direct trauma to the oropharynx and larynx and apart from this it also

causes stimulation resulting in rise in heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure.

Tachycardia, hypertension and dysrythymias all occur during laryngoscopy and intubations. The consequent rise in rate/pressure product may result in a myocardial oxygen demand which exceeds the oxygen supply resulting in myocardial ischeamia[2].This response is sympathetically mediated and can be attenuated by various drugs that block sympathetic activity and other drugs like calcium channel blocking drugs, lignocaine and magnesium. Studies have documented myocardial ischeamic changes due to reflex sympatho adrenal response immediately following laryngoscopy and intubation with a mean increase in systemic pressure of 40mmHg even in normotensive patients.

An increase in heart rate is more likely to produce signs of myocardial ischeamia than hypertension on the ECG. Indeed, in anaesthetized patient, the incidence of myocardial ischeamia on the ECG sharply increases in patients who experience a heart rate greater than 110bpm (ischeamic threshold). A frequent recommendation is to maintain heart rate and blood pressure within 20% of normal awake value for that patient.

Many attempts have been made to attenuate the pressor response to laryngoscopy and intubation.

For eg.

- Deep plane of anesthesia
- Topical anesthesia
- Use of ganglionic blockers
- Use of intravenous local anaesthetics
- Sodium nitroprusside infusion
- Magnesium sulphate
- Fentanyl
- Use of sympathetic blockers(beta-blockers,alpha$_2$agonists)
- Calcium channel blockers.

It has been clearly proven by various studies that sympathetic overactivity occurs during laryngoscopy and the importance of suppressing the sympathetic overactivity is well emphasized.

It has become evident that, $\alpha_2$adrenoceptor agonists may also be a useful class of drugs in conjunction with anesthesia [(3)]. They simultaneously potentiate the effects of general anesthetic agents, reduce their dose requirements and attenuate sympathoadrenal responses to noxious stimuli encountered during anesthesia and surgery, thus providing improved haemodynamic, metabolic and hormonal stability [(4)].

Dexmedetomidine is a highly selective and potent $\alpha_2$adrenoceptor agonist. It is a pure$\alpha_2$adrenoceptor agonist (α_1:α_2 ratio-1:1600) than clonidine which has only less selective agonist activity. (α_1:α_2 ratio-1:200)

Labetolol is combined $\alpha_1$andβ antagonist. In patients with no history of hypertension or significant cardiac disease, labetalol 0.3 or 0.6mg/kg i.v. is suited to blunting tachycardia and hypertension to laryngoscopy and intubation[5]

In this study which was carried out in the Institute of Anaesthesiology and Critical care at Madras medical college hospital, we compared intravenous labetalol and dexmeditomidine in attenuating haemodynamic stress response (increase in heart rate and an increase in the mean arterial pressure) to laryngoscopy and intubation, and find out which drug is better.

AIM

This study was done with the following intentions:

- To compare the efficacy of ***dexmeditomidine 1µg/kg; and labetolol 0.5mg/kg*** in attenuating the cardiovascular responses to Laryngoscopy and Intubation.

- To observe any adverse effects of these two in the specified dosage.

REVIEW OF LITERATURE

Laryngoscopy and intubation were being performed over many years, and the hemodynamic consequences are studied by many authors by using many methods and drugs.

Tachycardia and hypertension commonly occur during anaesthesia due to manyfactors like mechanical stimulation, and complex interaction of hypoxia, hypercapnia and circulating levels of catecholamines.

KING et.al[7]*.in 1951.*showed that there was a marked rise in blood pressure and heart rate during laryngoscopy which was due to the mechanical stimulation of sensitive receptors in the area of epiglottis.

KING and his associates[7] **(1960**) believed the reflex mechanisms to be essentially non-specific in character. They stated that the impulses initiating the reflex arc are probably carried over the vagus, while the effector system is less clearly defined and may be due to decreased parasympathetic or increased sympathetic adrenal activity.

KING et al (1951) used deep Ether anaesthesia to abolish the reflex circulatory response to tracheal intubation.

WYCOFF C.C.[33]**(1960)** in his study stated that topical anaesthesia of the pharynx along with superior laryngeal nerve blocks, reduced the increase in mean arterial pressure after intubation.

FORBES and DALLY (1970)[5] observed that laryngoscopy and endo tracheal intubation is immediately associated with an average increase in mean

arterial pressure of 25mm of Hg in all 22 normotensive patients. These responses were interpreted as due to reflex sympathetic adrenal stimulation.

PRY ROBERT et al [6](1971) found that the increases in heart rate and blood pressure are much more exaggerated in hypertensive patients.

FOEX et al (1971) observed

i. Inotropic Failure

ii. Ischemic arrhythmias and

iii. Cerebrovascular accidents.

In patients with uncontrolled hypertension who came up for emergency surgery and associated substantial increase in heart rate and blood pressure following laryngoscopy and endotracheal intubation which lasted for several minutes.

CHUNG et.al[1]in their study on haemodynamic responses to laryngoscopy and intubation showed maximum value of systolic, diastolic, mean arterial pressure and heart rate occur within 30 to 60 seconds of laryngoscopy and intubation, and in patients with hypertension, laryngoscopy and intubation led to left ventricular failure due to exaggerated pressure response. Similarly in patients with IHD transient myocardial ischaemia has been observed.

ARIES & SIMONIES[8] have correlated the levels of adrenaline and nor adrenaline with sympathetic innervation".

ROBERTS, C. GREEN, et. Al[6]showed an exaggerated form of rise in heart rate and mean arterial pressure in hypertensive patients during laryngoscopy and intubation.

A.J. SHRIBIRAN, G. SMITH et. a*l*[9] in a study of haemodynamic stress response to laryngoscopy alone and laryngoscopy followed by intubation, was done in 24 patients and the heart rate, MAP, and the plasma catecholamines before laryngoscopy and at 1st,3rd, and 5th min after laryngoscopy was assessed. There was a significant increase in the heart rate, mean arterial pressure and plasma catecholamine concentration following laryngoscopy with or without intubation.

ELLIOFF et al (1980) by echo cardiographic study found that there was substantial worsening of left ventricular wall function – akinesia, dyskinesia or hypokinesia following laryngoscopy and endotracheal intubation.

STEVEN M. HELFMAN, et al[10] observed that esmolol provides consistent and reliable protection from increase in both heart rate and systolic bloodpressure during and after intubation. Where as lignocaine and fentanyl failed to protect against increases in heart rate but provided protection against increase in systolic blood pressure equivalent to that provided by esmolol.

FLACKE at al[11](1987)observed that pre treatment with clonidine resulted in lower heart rate and blood pressure values both before and after induction as well as following endotracheal intubation and skin incision.

SCHEININ B[12]**et al**: found that Dexmedetomidine attenuated sympathoadrenal responses to tracheal intubation and reduced the need for thiopentone and peroperative fentanyl.

GÜLERet al[13].found that the increase in blood pressure and heart rate during the extubation is decreased and the quality of extubation is increased by dexmedetomidine.

JAAKOLA et al.[14]found that , during the intubation blood pressure and heart rate is significantly reduced by 0.6 $\mu g.kg^{-1}$dexmedetomidine.

TEZER et al.[15] found that sympathetic responses during laryngoscopy and intubation were effectively reduced by dexmedetomidine 1 $\mu g.kg^{-1}h^{-1}$ and esmolol 250 $\mu g.kg^{-1}min^{-1.}$

KHAN et al.[16] demonstrated that heart rate, systolic and diastolic blood pressure rise after intubation were reduced by dexmedetomidine.

AHO MS[17] demonstrated the analgesic properties of dexmedetomidine using it as single agent after minor surgery.

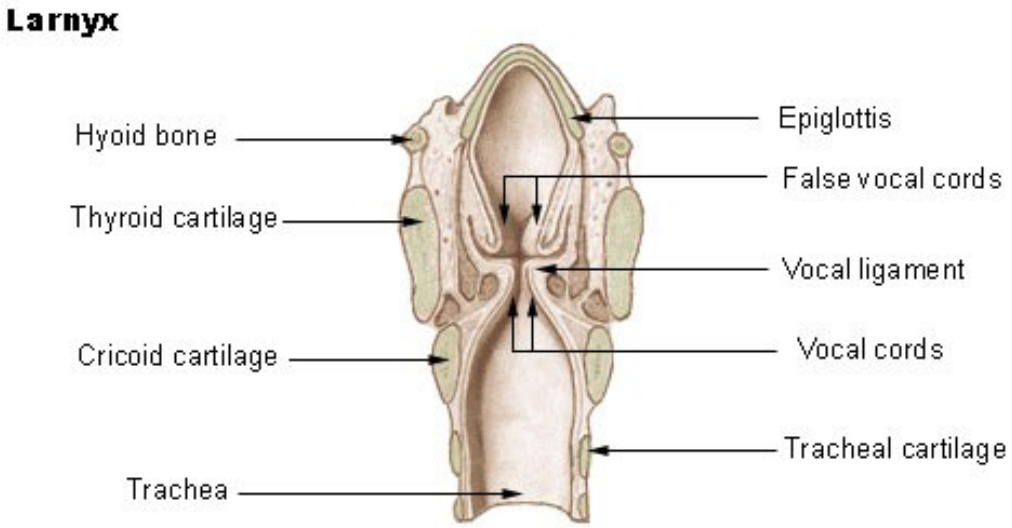
BERNSTEIN JSet al[18]: demonstrated the attenuation of hemodynamic responses to rapid sequence induction and intubation with labetalol.

INADA et al[19]. studied the effect of labetalol on the hemodynamic response to intubation.

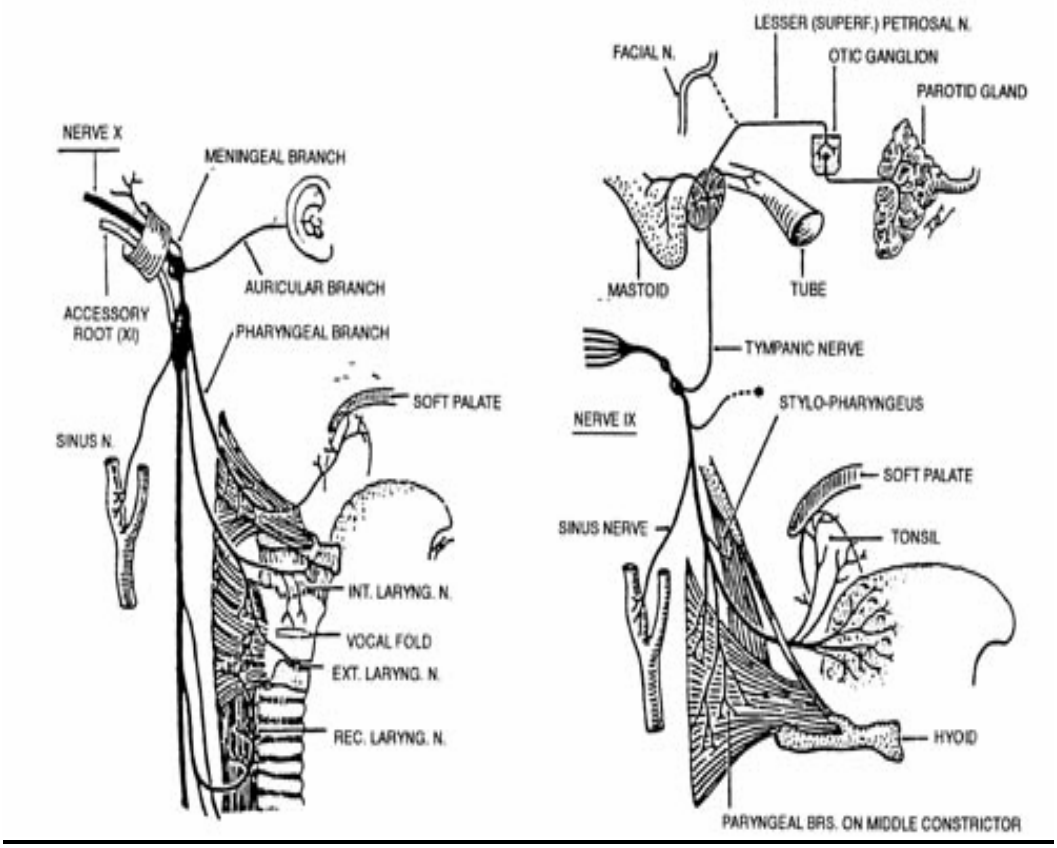
LESLIE JB et al.[20] found that pre induction intravenous labetalol attenuated the hemodynamic response to endotracheal intubation.

CHUNG KS.et al[21] studied The effect of an intermediate dose of labetalol on heart rate and blood pressure response to laryngoscopy and intubation.

ANATOMY OF LARYNX



NERVE SUPPLY OF LARYNX



ANATOMY AND NERVE SUPPLY OF THE UPPER AIRWAY[22]

The pharynx is a U shaped fibromuscular structure that extends from the base of the skull to the cricoid cartilage. It opens anteriorly into the nasal cavity, mouth and the larynx, which conveniently divides the pharynx into three parts termed as nasopharynx, oropharynx and laryngopharynx respectively. At the base of the tongue, the epiglottis functionally separate the oropharynx from the laryngopharynx.

Sensory nerve supply of the upper airway is derived from the cranial nerves trigeminal, glossopharyngeal and the vagus. The palatine nerve provides sensory fibers from trigeminal nerve to hard and soft palate. The lingual nerve provides general sensation to the anterior two thirds of the tongue, and the glossopharyngeal nerve to the posterior one third of the tongue.

Branches of the facial nerve and the glossopharyngeal nerve provide sensation of taste to anterior two thirds and posterior one third respectively.

The glossopharyngeal nerve also innervates the roof of the pharynx, the tonsils and the undersurface of the soft palate. The pharyngeal surface of epiglottis is supplied by the glossopharyngeal nerve and the laryngeal surface of the epiglottis is supplied by the vagus nerve. Internal laryngeal branch of superior laryngeal branch provides sensory supply to the supra glottic area. The

recurrent laryngeal nerve ascends to the larynx in the groove between the esophagus and trachea and divides into motor and sensory branches.

The motor branch supplies all the intrinsic muscles of the larynx except cricothyroid.

The sensory branch supplies the laryngeal mucous membrane below the level of vocal cords.

PHYSIOLOGY OF STRESS RESPONSE[23]

Haemodynamic stress response to laryngoscopy and intubation occurs as increase in the heart rate and the mean arterial pressure due to reflex sympathetic discharge in response to laryngo - tracheal stimulation.

Tracheal intubation alters respiratory and cardiovascular physiology by reflex response and also by the physical presence of endotracheal tube. Although these circulatory responses are transient and of little consequence in patients with normal circulatory system, they may be exaggerated in patients with coronary artery disease, reactive airways and intracranial pathology.

CARDIOVASCULAR RESPONSE

This transitory variable and unpredictable response is mediated by both sympathetic and parasympathetic nervous systems. Usually bradycardia seen in neonates and infants during laryngoscopy and intubation is the autonomic equivalent of laryngospasm response in adults. This reflex is mediated by an increase in vagal tone at the SA node and is virtually a monosynaptic response to a noxious stimuli in the airway.

The more common response to tracheal intubation is hypertension and tachycardia mediated by sympathetic efferents via the cardioaccelarator nerves and sympathetic chain ganglia .The polysynaptic nature of pathways from the IX and X nerve afferents to the sympathetic nervous system via the brain stem and spinal cord results in a diffuse autonomic response which includes

widespread release of norepinephrine from the adrenergic terminals and release of epinephrine from the adrenal medulla.

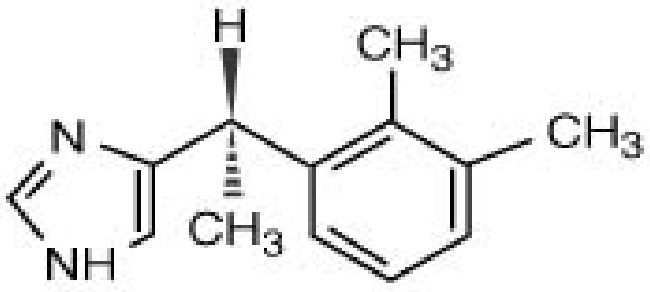
One other reason for the hypertensive response is due to activation of rennin- angiotensin system with release of renin from the renal juxtaglomerular apparatus, an end organ innervated by adrenergic nerve terminals.

PHARMACOLOGY OF DEXMEDITOMIDINE[24]

Dexmedetomidine is the most recently released IV anesthetic. It is a highly selective α_2-adrenergic agonist that produces sedation, hypnosis, and analgesia. Dexmedetomidine is presently approved only for brief (<24 hours) postoperative sedation, although it is finding increasing use in the perioperative period as an adjunct sedative. Its primary action is as an agonist on α_2 receptors in the locus caeruleus. It has minimal effect on respiration. Dexmedetomidine produces a biphasic effect on blood pressure; at low concentrations, mean blood pressure is decreased, and at higher concentrations, blood pressure is increased. Heart rate and cardiac output show a concentration-dependent decrease. Dosing for sedation is a loading dose of 0.25 to 1 mg/kg over a 10-minute period, followed by an infusion of 0.1 to 1 µg/kg/hr.

Physicochemical characteristics

Dexmedetomidine is the d-enantiomer of medetomidine, a substance that has been used for sedation and analgesia in veterinary medicine for many years. It shows a high ratio of specificity for the α_2 receptor α_2/α_1 (1600:1) compared with clonidine (α_2/α_1 200:1), making it a complete 2α agonist.



Chemical structure of dexmedetomidine

Metabolism and Pharmacokinetics[25]

Dexmedetomidine belongs to the imidazole subclass of α_2 receptor agonists.

Dexmedetomidine is rapidly distributed and extensively metabolized in the liver and excreted in urine and feces. It undergoes conjugation (41%), n-methylation (21%), or hydroxylation followed by conjugation.

Dexmedetomidine is 94% protein bound, and its concentration ratio between whole blood and plasma is 0.66.

Dexmedetomidine has profound effects on cardiovascular variables and may alter its own pharmacokinetics. With large doses, there is marked vasoconstriction, which probably reduces the drug's volumes of distribution.

Elimination Half-Life (hr)	**Clearance (mL/kg/min)**	**Vd_{SS} (L/kg)**
2-3	10-30	2-3

These pharmacokinetic parameters apparently are unaltered by age or weight or renal failure, but clearance is a function of height. The elimination half-life of dexmedetomidine is 2 to 3 hours, with a context-sensitive half-time ranging from 4 minutes after a 10-minute infusion to 250 minutes after an 8-hour infusion. Postoperative patients sedated with dexmedetomidine display similar pharmacokinetics to the pharmacokinetics seen in volunteers[26]

CLINICAL EFFECTS

Effects on the Central Nervous System

Sedation

The α_2 agonists produce their sedative-hypnotic effect by an action on α_2 receptors in the locus caeruleus and an analgesic action at α_2 receptors within the locus caeruleus and within the spinal cord.[27] The quality of sedation produced by dexmedetomidine seems different compared with that produced by other sedatives acting through the GABA systems. Patients receiving dexmedetomidine infusions as part of their sedation regimen in the postoperative ICU setting have been described as being very easy to wake up and having the ability to follow commands and cooperate while being tracheally intubated. Undisturbed, patients were noted to fall asleep.

Despite sound levels of sedation with dexmedetomidine, there is limited respiratory depression, providing wide safety margins. This characteristic allows for "daily wake up" tests to be done in a safe fashion. This critical test—when ventilated ICU patients are taken off all sedatives to assess their mental status and titrate sedation—shortens their ventilated and ICU length of stay.

Mechanism of action

The α_2 agonists act through the endogenous sleep-promoting pathways to exert their sedative effect. Dexmedetomidine produces a decrease in activity of the projections of the locus caeruleus to the ventrolateralpreoptic nucleus. This increases GABAergic and galanin release in the tuberomammillary

nucleus, producing a decrease in histamine release in cortical and subcortical projections.

The α_2 agonists seem to inhibit ion conductance through L-type or P-type calcium channels and facilitate conductance through voltage-gated calcium-activated potassium channels. The similarity between natural sleep (non–rapid eye movement) and dexmedetomidine-induced hypnosis has been speculated to maintain cognitive and immunologic function in the sleep-deprived states (as in the ICU)

Dexmedetomidine can produce profound sedation, and it has been used as a total IV anesthetic when given at 10 times the normal sedation concentration range.

Analgesia

The analgesic effects of dexmedetomidine are complex. $Alpha_2$ agonists do have an analgesic effect when injected via the intrathecal or epidural route. Clonidine injected in the neural axis helps with short-term pain, cancer pain, and neuropathic pain. When dexmedetomidine is injected into the epidural space, it rapidly diffuses into the CSF. The effects on blood pressure are slower in onset with an epidural injection than with an intrathecal administration. Epidural effects are seen in 5 to 20 minutes.

The primary site of analgesic action is thought to be the spinal cord. Systemic use of dexmedetomidine shows narcotic sparing. In the postoperative

ICU setting, narcotic requirements were reduced by 50% when patients were receiving a dexmedetomidine drip compared with placebo.

Other Central Nervous System Effects

Administration of dexmedetomidine produced the predicted reduction of cerebral blood flow with a concomitant reduction in cerebral metabolic rate. This finding suggests the maintenance of the cerebral oxygen supply-to-demand relationship.

Dexmedetomidine has been used in neurosurgical procedures involving neurophysiologic monitoring. Cortical evoked potentials amplitudes and latencies were minimally affected when using dexmedetomidine intraoperatively when patients underwent craniotomies. Dexmedetomidine also is able to reduce muscle rigidity after high-dose opioid administration.

Effects on the Respiratory System

In volunteers, dexmedetomidine at concentrations producing significant sedation reduces minute ventilation, but retains the slope of the ventilatory response to increasing carbon dioxide. The changes in ventilation appeared similar to those observed during natural sleep. Infusing dexmedetomidine to concentrations of 15 ng/mL in spontaneously breathing volunteers, showed no change in arterial oxygenation or pH. At the highest concentrations, $PaCO_2$ increased by 20%. Respiratory rate increase with increasing concentration from 14 breaths/min to 25 breaths/min. When dexmedetomidine and propofol were titrated to equal sedative end points (BIS of 85), both resulted in no change in

respiratory rate. In a study comparing the effects of remifentanil and dexmedetomidine on respiratory parameters in normal volunteers the hypercapnic ventilatory response was unaffected even at doses that produced unresponsiveness to vigorous stimulation. $PaCO_2$ increased mildly with dexmedetomidine, but it reached a plateau after the first increment. Dexmedetomidine also exhibited a hypercarbic arousal phenomenon, which has been described during normal sleep and is a safety feature.

Effects on the Cardiovascular System

The basic effects of α_2 agonists on the cardiovascular system are decreased heart rate; decreased systemic vascular resistance; and indirectly decreased myocardial contractility, cardiac output, and systemic blood pressure. The hemodynamic effects of a bolus of dexmedetomidine in humans have shown a biphasic response. An acute IV injection of 2 μg/kg resulted in an initial increase in blood pressure (22%) and decrease in heart rate (27%) from baseline that occurred at 5 minutes after injection. This initial increase in blood pressure is probably due to the vasoconstrictive effects of dexmedetomidine when stimulating peripheral α_2 receptors. Heart rate returned to baseline by 15 minutes, and blood pressure gradually declined to approximately 15% below baseline by 1 hour. After an IM injection of the same dose, the initial increase in blood pressure was not seen, and heart rate and blood pressure remained within 10% of baseline.

The incidence of hypotension and bradycardia may be related to the administration of a loading dose. Omitting the loading dose or not giving more than 0.4 μg/kg reduces the incidence of hypotension, or makes it less

pronounced. Giving the loading dose over 20minutes also minimizes the transient hypertension. In several studies after IM and IV administration, dexmedetomidine caused, in a small percentage of patients, profound bradycardia (<40 beats/min) and occasionally sinus arrest/pause. Generally, these episodes resolved spontaneously or were readily treated without adverse outcome by anticholinergics. It would be expected from its profile that dexmedetomidine would be beneficial to the ischemic myocardium

The perioperative use of α_2 agonists reduces the incidence of perioperative myocardial ischemia.

No rebound effects have been found when discontinuing dexmedetomidine drips, even when it is given for more than 24 hours

A frequently reported side effect of dexmedetomidine has been a dry mouth. Dry mouth is due to a decrease in saliva production

Uses

Dexmedetomidine has been approved as a short-term sedative for adult intubated patients in the ICU. Given its well-documented beneficial effects of anxiolysis, sedation, analgesia, and sympatholysis with minimal respiratory depression,

The unique characteristics of dexmedetomidine—providing adequate sedation with minimal respiratory depression—can be used when weaning patients from the ventilator. The use of dexmedetomidine to facilitate daily "wake up" tests in mechanically ventilated patients seems attractive

As a premedicant, dexmedetomidine, at IV doses of 0.33 to 0.67 μg/kg given 15minutes before surgery, seems efficacious, while minimizing the cardiovascular side effects of hypotension and bradycardia. Within this dosage range, dexmedetomidine reduces thiopental requirements (by ±30%) for short procedures, reduces the requirements of volatile anesthetics (by ±25%), and more effectively attenuates the hemodynamic response to endotracheal intubation compared with 2 μg/kg of fentanyl.

Dexmedetomidine also has been evaluated as an IM injection (2.5 μg/kg) with or without fentanyl administered 45 to 90 minutes before surgery. This regimen was compared with IM midazolam plus fentanyl and was found to provide equal anxiolysis, reduced response to intubation, smaller volatile anesthetic requirements, and a decreased incidence of postoperative shivering but a higher incidence of bradycardia. Atipamezole, a selective α_2 antagonist, at 50 μg/kg was effective in reversing the sedation of dexmedetomidine (2 μg/kg intramuscularly), when used to provide sedation for brief operative procedures. This reversal of effects resulted in a more rapid recovery than occurred after equisedative doses of midazolam.

Dexmedetomidine has been used for sedation for monitored anesthesia care.[28]

Dexmedetomidine sedation has been done successfully in pediatric patients.[29]

When dexmedetomidine is used as a premedication 10 minutes before general surgery for cataract removal, intraocular pressure is decreased (33%),

catecholamine secretion is reduced, perioperative analgesic requirements are less, and recovery is more rapid.

For maintenance of anesthesia, dexmedetomidine has been used in patients undergoing multiple types of surgery. In patients given an infusion regimen to achieve a plasma concentration of slightly less than 1 ng/mL, combined with 70% nitrous oxide, dexmedetomidine reduced isoflurane requirements by 90% compared with a control group.

Grant and colleagues described the use of dexmedetomidine when securing the airway with a fiberoptic intubation in three patients undergoing cervical spine surgery. The procedure was well tolerated with no hemodynamic compromise or respiratory depression.[30]

Because this drug provides good sedation with minimal respiratory depression, it has been used in patients undergoing awake craniotomies with functional testing and electrocorticography or awake carotid endarterectomies with fewer fluctuations from the desired sedation level and more stable hemodynamics.

Another use of dexmedetomidine has been as an anesthetic adjunct or sedative agent for patients who are susceptible to narcotic-induced respiratory depression or sleep apnea. In a morbidly obese patient, the narcotic-sparing effects of dexmedetomidine were evident intraoperatively and postoperatively after bariatric surgery. The addition of dexmedetomidine infusions to assist on transesophageal echocardiography examination has been described, with better

hemodynamic profile and improved patient satisfaction than with benzodiazepine and narcotics alone, with no added respiratory depression.

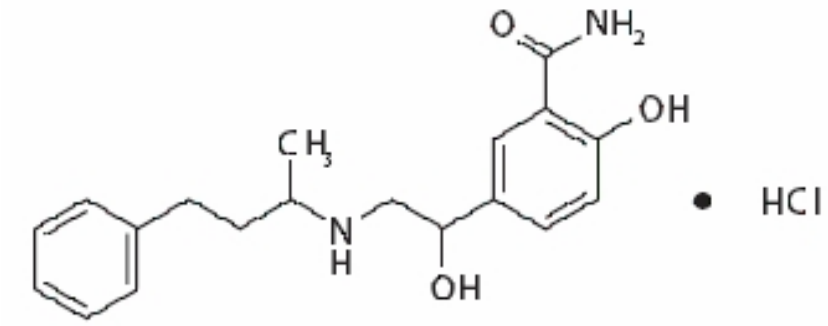
This highly selective α_2 agonist has a set of unique effects that include titratable sedation, sympatholysis, and analgesia without significant respiratory depression. Originally approved as a sedative in the ICU, it has found many off-label applications in the ICU, the operating room, and perioperative environment. The off-label use of dexmedetomidine in infants and children is rapidly increasing.

PHARMACOLOGY OF LABETALOL[31]

Labetalol Hydrochloride is an adrenergic receptor blocking agent that has both selective alpha-adrenergic and nonselective beta-adrenergic receptor blocking actions in a single substance.

Labetalol hydrochloride (hcl) is a racemate consists of four isomers chemically designated as 5-[1-Hydroxy-2-[(1-methyl-3phenylpropyl) amino] ethyl] - salicylamidemonohydrochloride and it has the following structural formula:

Chemical structure of labetalol



Physical properties

Labetalol has the molecular formula CHNO•hcland a molecular weight of 364.87.

It has two asymmetric centers and therefore exists as a molecular complex of two diastereoisomeric pairs. Dilevalol, the R,R' stereoisomer, makes up 25% of racemic labetalol.

Pharmacology[32]

Labetalol combines both selective, competitive, alpha-adrenergic blocking and nonselective, competitive, beta-adrenergic blocking activity in a single substance. In man, the ratios of alpha- to beta-blockade have been estimated to be approximately 1:3 and 1:7 following oral and intravenous administration, respectively.

The capacity of labetalol to block alpha receptors has been demonstrated by attenuation of the pressor effect of phenylephrine and by a significant reduction of the pressor response caused by immersing the hand in ice-cold water ("cold-pressor test").

Labetalol's beta-receptor blockade was demonstrated by a small decrease in the resting heart rate, attenuation of tachycardia produced by isoproterenol or exercise, and by attenuation of the reflex tachycardia to the hypotension produced by amyl nitrite. Beta-receptor blockade was demonstrated by inhibition of the isoproterenol-induced fall in diastolic blood pressure. Both the alpha- and beta-blocking actions of orally administered labetalol contribute to a decrease in blood pressure in hypertensive patients. Labetalol consistently, in dose-related fashion, blunted increases in exercise-induced blood pressure and heart rate, and in their double product. The pulmonary circulation during exercise was not affected by labetalol dosing.

Single oral doses of labetalol administered to patients with coronary artery disease had no significant effect on sinus rate, intraventricular conduction, or QRS duration. The atrioventricular (A-V) conduction time was

modestly prolonged. Intravenous labetalol slightly prolonged A-V nodal conduction time and atrial effective refractory period with only small changes in heart rate. The effects on A-V nodal refractoriness were inconsistent.

Labetalol produces dose-related falls in blood pressure without reflex tachycardia and without significant reduction in heart rate, presumably through a mixture of its alpha-blocking and beta-blocking effects. Hemodynamic effects are variable, with small, nonsignificant changes in cardiac output seen in some studies but not others, and small decreases in total peripheral resistance. Elevated plasma renins are reduced.

Metabolism

The metabolism of labetalol is mainly through conjugation to glucuronide metabolites. These metabolites are present in plasma and are excreted in the urine and, via the bile, into the feces. Approximately 55% to 60% of a dose appears in the urine as conjugates or unchanged labetalol within the first 24 hours of dosing.

Labetalol has been shown to cross the placental barrier in humans. Only negligible amounts of the drug crossed the blood-brain barrier in animal studies. Labetalol is approximately 50% protein bound. Neither hemodialysis nor peritoneal dialysis removes a significant amount of labetalol from the general circulation (<1%).

Following intravenous infusion of labetalol, the elimination half-life is about 5.5 hours and the total body clearance is approximately 33 ml/min/kg.

The plasma half-life of labetalol following oral administration is about 6 to 8 hours. In patients with decreased hepatic or renal function, the elimination half-life of labetalol is not altered; however, the relative bioavailability in hepatically impaired patients is increased due to decreased “first-pass” metabolism

Uses

Labetalol hclinjection is indicated for control of blood pressure in severe hypertension.

Intravenous labetalol has been shown to be effective in lowering blood pressure and relieving symptoms in patients with pheochromocytoma; higher than usual doses may be required. However, paradoxical hypertensive responses have been reported in a few patients with this tumor; therefore, use caution when administering labetalol to patients with pheochromocytoma.

Labetalol is one of the drugs of choice in PIH as this drug does not reduce the uterine perfusion pressure.

Drug interactions

Since labetalol may be administered to patients already being treated with other medications, including other antihypertensive agents, careful monitoring of these patients is necessary to detect and treat promptly any undesired effect from concomitant administration

Drug possessing beta-blocking properties can blunt the bronchodilator effect of beta-receptor agonist drugs in patients with bronchospasm; therefore, doses greater than the normal antiasthmatic dose of beta-agonist bronchodilator drugs may be required.

Cimetidine has been shown to increase the bioavailability of labetalol administered orally. Since this could be explained either by enhanced absorption or by an alteration of hepatic metabolism of labetalol, special care should be used in establishing the dose required for blood pressure control in such patients.

Synergism has been shown between halothane anesthesia and intravenously administered labetalol. During controlled hypotensive anesthesia using labetalol in association with halothane, high concentrations (3% or above) of halothane should not be used because the degree of hypotension will be increased and because of the possibility of a large reduction in cardiac output and an increase in central venous pressure. The anesthesiologist should be informed when a patient is receiving labetalol.

Labetalol blunts the reflex tachycardia produced by nitroglycerin without preventing its hypotensive effect. If labetalol is used with nitroglycerin in patients with angina pectoris, additional antihypertensive effects may occur.

Care should be taken if labetalol is used concomitantly with calcium antagonists of the verapamil type.

While taking beta-blockers, patients with a history of severe anaphylactic reaction to a variety of allergens may be more reactive to repeated challenge, either accidental, diagnostic, or therapeutic. Such patients may be unresponsive to the usual doses of epinephrine used to treat allergic reaction

Contraindications

Labetalol injection is contraindicated in bronchial asthma, overt cardiac failure, greater-than-first-degree heart block, cardiogenic shock, severe bradycardia, other conditions associated with severe and prolonged hypotension, and in patients with a history of hypersensitivity to any component of the product

Labetalol should not be used in patients with a history of obstructive airway disease, including asthma.

Side effects

Most adverse effects have been mild and transient. Symptomatic postural hypotension (incidence, 58%) is likely to occur if patients are tilted or allowed to assume the upright position within 3 hours of receiving labetalol .

The incidence of adverse reactions depends upon the dose of labetalol. The largest experience is with oral labetalol.

Cardiovascular: Hypotension, and rarely, syncope, bradycardia, heart block.

Liver and Biliary System: Hepatic necrosis, hepatitis, cholestatic jaundice, elevated liver function tests.

Hypersensitivity: Rare reports of hypersensitivity (e.g., rash, urticaria, pruritus, angioedema, dyspnea) and anaphylactoid reactions.

Overdosage with labetalol causes excessive hypotension that is posture sensitive and, sometimes, excessive bradycardia. Patients should be placed supine and their legs raised if necessary to improve the blood supply to the brain. If overdosage with labetalol follows oral ingestion, gastric lavage or pharmacologically induced emesis (using syrup of ipecac) may be useful for removal of the drug shortly after ingestion. The following additional measures should be employed if necessary:

Excessive bradycardia — administer atropine or epinephrine.

Cardiac failure — administer a digitalis glycoside and a diuretic. Dopamine or dobutamine may also be useful.

Hypotension — administer vasopressors, e.g., norepinephrine. There is pharmacologic evidence that norepinephrine may be the drug of choice.

Bronchospasm —administer epinephrine and/or an aerosolized beta-agonist.

Seizures—administer diazepam.

In severe beta-blocker overdose resulting in hypotension and/or bradycardia, glucagon has been shown to be effective when administered in

large doses (5 to 10 mg rapidly over 30 seconds, followed by continuous infusion of 5 mg per hour that can be reduced as the patient improves).

Neither hemodialysis nor peritoneal dialysis removes a significant amount of labetalol from the general circulation (<1%).

Cautions

If the patient has laboratory evidence of liver injury or jaundice, labetalol should be stopped and not restarted.

The necessity or desirability of withdrawing beta-blocking therapy before major surgery is controversial. Protracted severe hypotension and difficulty in restarting or maintaining a heartbeat have been reported with beta-blockers. The effect of labetalol's alpha-adrenergic activity has not been evaluated in this setting.

Caution must be observed when reducing severely elevated blood pressure. A number of adverse reactions, including cerebral infarction, optic nerve infarction, angina, and ischemic changes in the electrocardiogram, have been reported with other agents when severely elevated blood pressure was reduced over time courses of several hours to as long as 1 or 2 days. The desired blood pressure lowering should therefore be achieved over as long a period of time as is compatible with the patient's status.

Symptomatic postural hypotension (incidence, 58%) is likely to occur if patients are tilted or allowed to assume the upright position within 3 hours of

receiving labetalol injection. Therefore, the patient's ability to tolerate an upright position should be established before permitting any ambulation.

Hypotension, bradycardia, hypoglycemia, and respiratory depression have been reported in infants of mothers who were treated with labetalol for hypertension during pregnancy.

Small amounts of labetalol (approximately 0.004% of the maternal dose) are excreted in human milk. Caution should be exercised when labetalol is administered to a nursing woman.

METHODOLOGY

Study design;

Prospective randomized comparative placebo controlled double blinded study

Materials and Methods:

Study population:

90 ASA I and II patients aged15– 60 years undergoing elective ENT surgeries (mastoidectomy, FESS, stapedectomy and myringoplasty) under general anesthesia were chosen for the study.

Exclusion criteria:

Difficult airway

Hypertension

Diabetes mellitus

Ischaemic heart disease

Renal disease

Cerebrovascular disease

Patients on beta blockers, alpha blockers.

Bronchial asthma

Allergy to study drug

Methodolgy:

After obtaining ethical committee approval, the study population was chosen. All the patients were assessed preoperatively with history, clinical examination, and required investigations

Informed written consent obtained from the patient.The surgeon was informed about the study.

The patients were randomly allocated into three groups.

Group D(30 no) received Dexmedetomidine 1 μg/kg in 10ml normal saline i.v. over 10 min, 5min before induction of anaesthesia

Group L (n:30) received Labetalol 0.5mg/kgin 10ml normal saline i.v. over 10min, 5min before induction of anaesthesia

Group P (n:30) received10ml normal saline i.v. over 10min, 5min before induction of anaesthesia

All patients were premedicated with Inj. Midazolam 2mg and Inj. Glycopyrrolate 0.2mg I.m. 45 min prior to surgery. Heart rate , systolic and diastolic blood pressure and oxygen saturation were recorded as base line value.

All patients were monitored with ECG, pulse oximetry continuously and NIBP at 5 min intervals. Patients received study drug 5 min prior to induction according to the group.

All patients were preoxygenated with 100% oxygen. Patients were induced with inj. Thiopentone 5mg/kg, Inj. Fentanyl 2µg/kg followed by Vecuronium 0.08mg.kg. Entotracheal intubation was done 2min after vecuronium. Anaesthesia was maintained with Isoflurane in oxygen and Nitrous oxide(33%and66%respectively).

Parameters for analysis:

SBP, DBP, MAP, HR and SpO2 were monitored 1 minute after infusion of study drug, 1minute after induction and 1,3,5,10 and15 minutes after intubation.

During intubation, laryngoscopy duration and Cormack lehane score were noted.

Any incidence of hypotension or bradycardia was recorded.Hypotension is defined as decrease in MAP 30% or more from baselineand treated with inj.ephedrine6mg.. Bradycardia is defined as HR<50/min and treated with inj.atropine0.6mg.

Results were tabulated and analysed

RESULTS

The study was done 1n 90 patients belonging to ASA class I and II undergoing elective surgeries under general anesthesia. The patients were categerised into 3 groups.

Group D Dexmeditomidine

Group L Labetalol

Group P Placebo

Statistical analysis

We used Chi-Square test, ANOVA and Post-Hoc test as appropriate. $p<0,05$ was considered statistically significant. The results were presented as means and SD.

TABLE - 1

DEMOGRAPHIC CHARACTERISTICS BETWEEN GROUPS

Parameters	Group D	Group L	Group P	P value
Mean age in years±SD	31.17± 11.8	34.5± 15	32.9 ±11.7	0.606
Mean wt in kgs± SD	58.2± 9.8	58.1 ±9.2	56.8± 9.3	0.828

SD- Standard deviation P>0.05-not significant

TABLE - 2

	Male	Female
Group D	19	11
Group L	16	14
Group P	11	19

The groups were matched for demographic data, and there was no statistically significant difference found between the groups in age, sex and weight.

FIGURE - 1

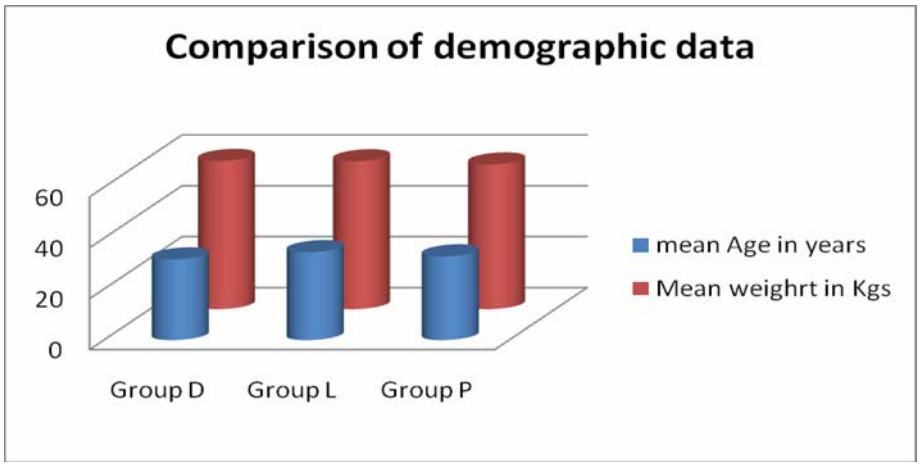


FIGURE - 2

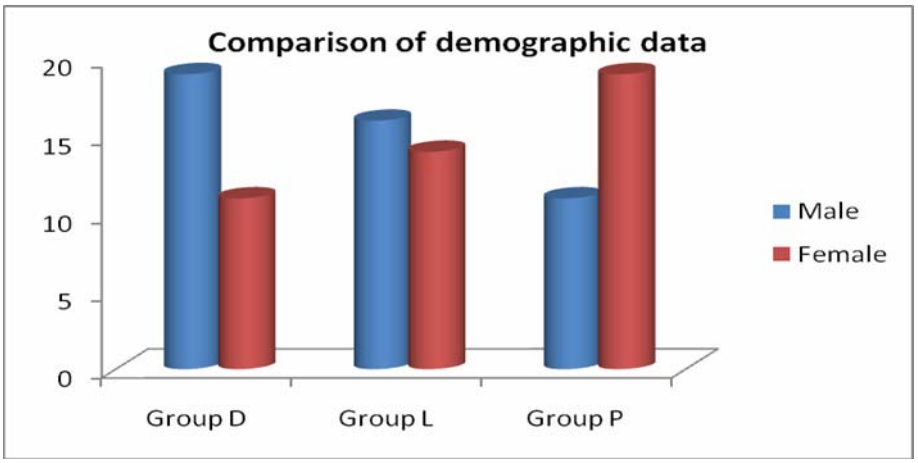


TABLE - 3

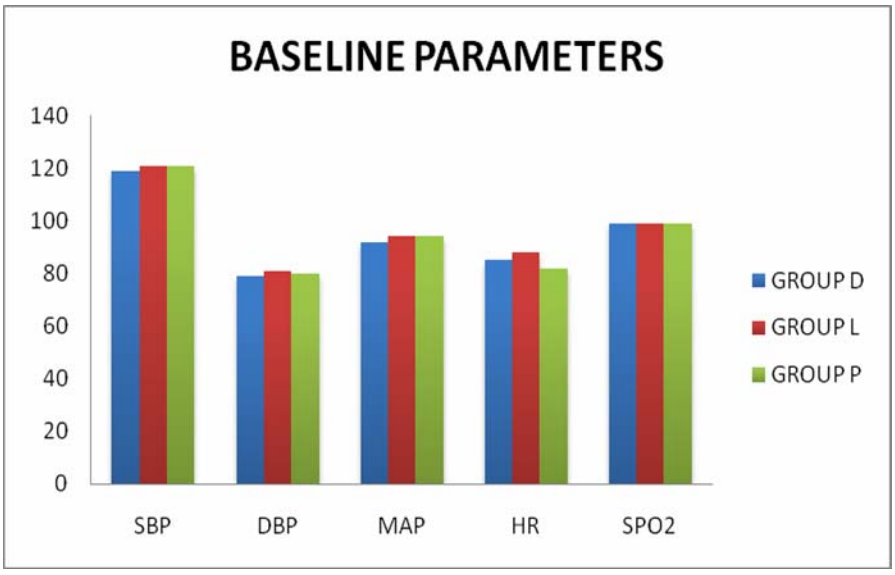
BASE LINE PARAMETERS

	Group D	Group L	Group P	P Value
SBP ±SD	119.3±8.8	121.5± 11	121.7 ±8.9	0.564
DBP ±SD	78.8 ±6.65	81.2 ±6.7	80.4 ±5.4	0.339
MAP ±SD	92.17 ±6.3	94.5 ±7.3	93.9 ±6.6	0.380
HR±SD	85.13± 8.96	88.±10	81.8± 11	0.064
SPO_2±SD	99± 0.6	99 ±0.5	99± 0.6	0.916

SD- Standard deviation **'P'**Value **>0.05**

Baseline parameters are comparable between groups. There is no statistically significant difference between the groups.

FIGURE - 3



After administration of the study drug blood pressure, heart rate and saturation were recorded 1 minute following the injection of the drug, 1 min after induction,1 min, 3min, 5 min,10 min and 15 min after laryngoscopy and intubation.

TABLE – 4

HEART RATE, SYSTOLIC BLOOD PRESSURE, DIASTOLIC BLOOD PRESSURE AND MEAN ARTERIAL PRESSURE AFTER DRUG INJECTION

After drug injection	Group D	Group L	Group p	' P'	Significance
Heart rate	65.87±5.3	76.7±8.9	79.8±8.62	0.001	Significant
Systolic B.P	118.07±9.5	113±8.3	119.8±8	0.709	Not significant
DiastolicB.P	76.7±7.7	76.7±6	79.3±4.7	0.196	Not significant
MAP	90.4±7.4	88.53±6.7	92.5±5.3	0.063	Not significant
SPO2	98.7±0.7	99±0.5	99±0.5	0.101	Not significant

FIGURE - 4

Table 4 shows the mean heart rate, mean systolic and mean diastolic blood pressure after injection. There is statistically significant difference in mean heart rate of patients across 3 groups ($p< 0.01$). The mean heart rate of group D is lower than that of both the group L and P.

There is no statistical difference in the mean systolic diastolic blood pressure and SPO2 among 3 groups.

TABLE – 5

DEVIATION OF HEART RATE FROM BASELINE

Heart Rate	**Group D**	**Group L**	**Group P**	**'P'**
After drug	65.9 ±5.3	76.7± 9	80± 8.6	0.001
After induction	73.3 ±4.13	83.5± 7.25	86.7 ±8.2	0.001
After intubation 1min	76.4±5.6	95.2±10.6	114±12.97	0.001
3 min	74.4±5.6	91±10.64	108±11	0.001
5 min	72.5±5.77	86.57±8.9	100.7±9.69	0.001
10 min	71.1±4.84	83.0±7.3	91.9±9.2	0.001
15 min	70.83±4.1	81.3±7.2	87.47±7.7	0.001

SD standard deviation **'P'**<0.05-Significant

Heart rate decreased after injection of the drug in dexmeditomidine group and labetalol group compared to placebo. The fall in heart rate was more in group D than in group L. Heart rate increase after intubation is more in Placebo group than Group D or Group L.

TABLE – 6

COMPARISON BETWEEN GROUP D AND GROUP L

Heart Rate Mean±Sd	**Group D**	**Group L**	**'P'**
After drug	65.9 ±5.3	76.7± 9	0.001
After induction	73.3 ±4.13	83.5± 7.25	0.001
After intubation 1min	76.4±5.6	95.2±10.6	0.001
3 min	74.4±5.6	91±10.64	0.001
5 min	72.5±5.77	86.57±8.9	0.001
10 min	71.1±4.84	83.0±7.3	0.001
15 min	70.83±4.1	81.3±7.2	0.001

SD- Standard deviation **'P'<0.05-**Significant

Heart rate response to laryngoscopy and intubation was effectivevely suppressed in dexmed group (GroupD) compared to labetalol group(Group L)

FIGURE - 5

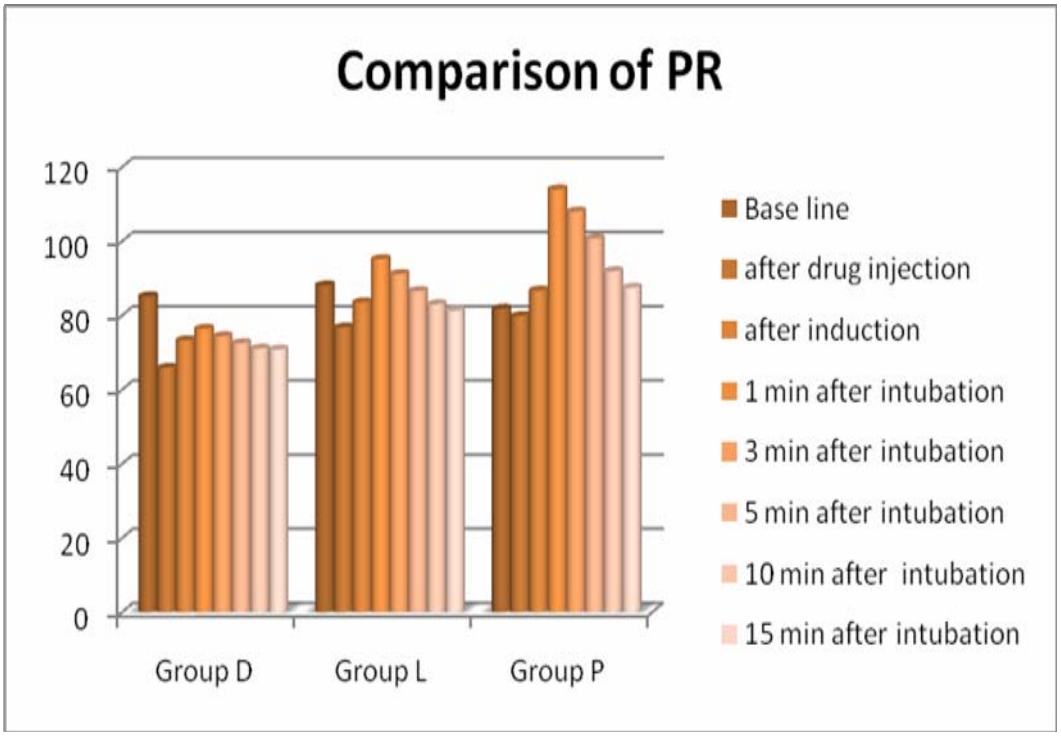


FIGURE - 6

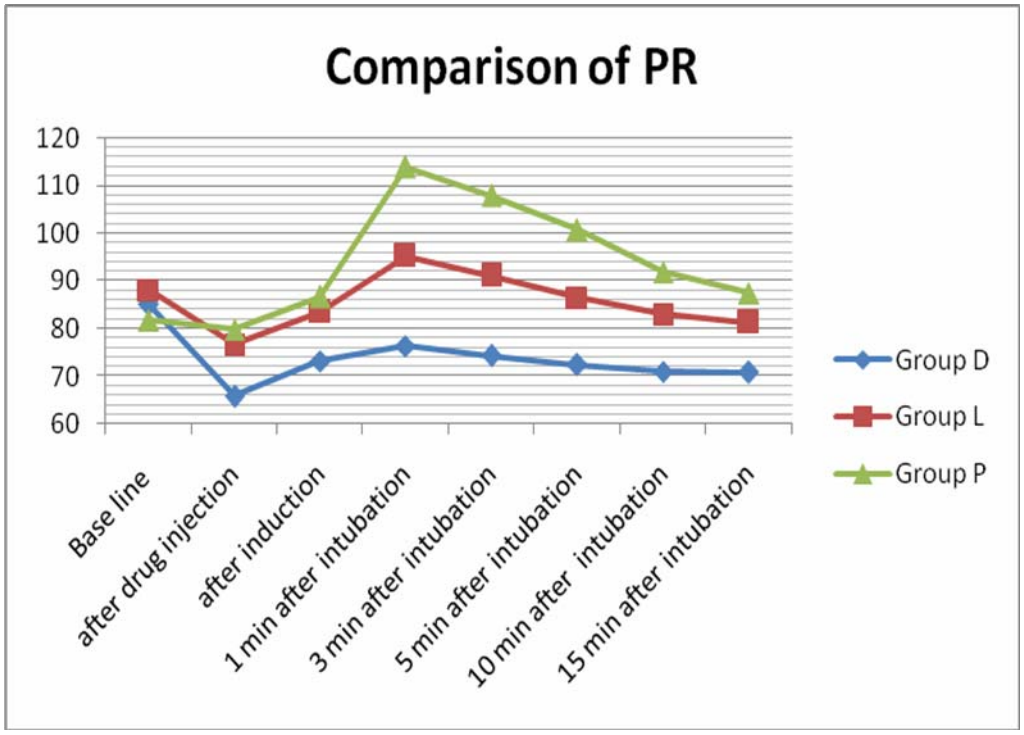


TABLE – 7

COMPARISON OF SYSTOLIC ARTERIAL PRESSURE RESPONSE

Blood Pressure mean±SD	Group D	Group L	Group P	'P'
Baseline	119.3± 8.8	121.5 ±11	121.7± 8.9	0.564
After Drug	118±9.5	113±8.3	119±8	0.090
After Induction	112.4±8.5	108.9±8.3	111.3±9	0.288
After Intubation 1min	118.9±7.4	131.1±9.2	152.67±9.6	0.001
3 Min	116.9±7.7	127.67±8.5	146±8.6	0.001
5 Min	114.5± 7.8	124.9 ±8.1	139.7± 6.8	0.001
10 Min	111.9 ±7.7	121.9 ±7.5	133.2± 6.7	0.001
15 Min	111.8 ±6.8	120.23 ±7.3	127 ±6.1	0.001

SD- Standard deviation 'P'<0.05-Significant

FIGURE - 7

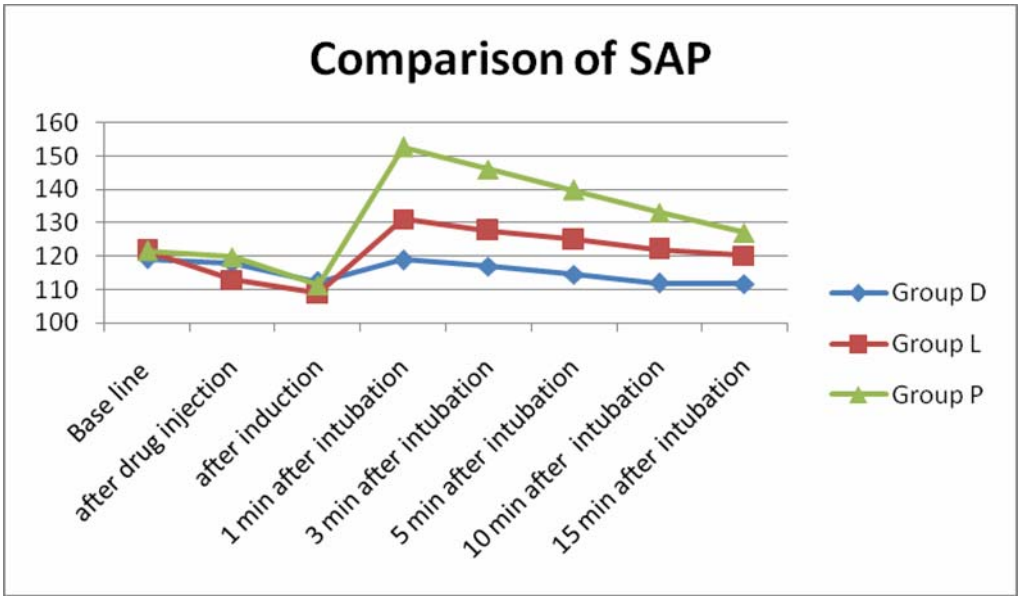


TABLE – 8

COMPARISON OF DIASTOLIC ARTERIAL PRESSURE RESPONSE

Blood pressure Mean±SD	Group D	Group L	Group P	'P'
Baseline	78.8±6.6	81.2 ±6.7	80.37±5.4	0.339
After drug	76.73±7.7	76.7±6.3	79.33±4.9	0.196
After induction	73.2±6.9	73.67±6.4	73.77±5.2	0.932
After intubation 1min	79.8±5.5	88±5.8	106.97±8.4	0.001
3 min	76.73±4.7	86.57±6.2	101.73±6.8	0.001
5 min	74.9 ±4.2	84.2± 5.9	96.3± 6.7	0.001
10 min	73.73 ±3.4	80.8± 4.5	90.43± 6.4	0.001
15 min	73.27± 3.4	79.8 ±4.8	83.87± 5.8	0.001

SD- Standard deviation 'P'<0.05-Significant

FIGURE - 8

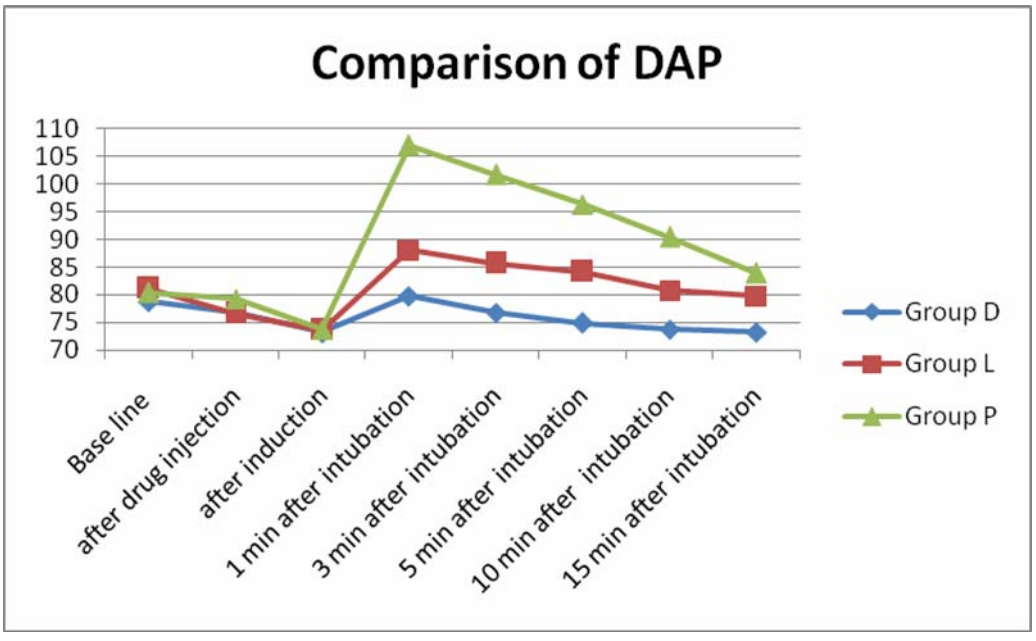


TABLE – 9

COMPARISON OF MEAN ARTERIAL PRESSURE RESPONSE

Blood pressure Mean±SD	Group D	Group L	Group P	'P'
Baseline	92.17± 6.3	94.4 ±7.3	94± 6.3	0.380
After drug	90.43±7.4	88.5±6.7	92.57±5.3	0.063
After induction	86.47±6.7	85.1±6.6	73.77±5.2	0.701
After intubation 1min	92.87 ±5.5	102.7± 6.6	122.5 ±7.7	0.001
3 min	90 ±4.8	100 ±6.6	116.37± 7.2	0.001
5 min	88.1± 4.6	97.6± 6.3	110.3 ±6.5	0.001
10 min	86.73 ±3.9	94.4 ±5.2	104.8 6.4	0.001
15 min	86.13 ±3.8	93.2± 5.5	97.9 5.2	0.001

SD- Standard deviation 'P'<0.05-Significant

FIGURE - 9

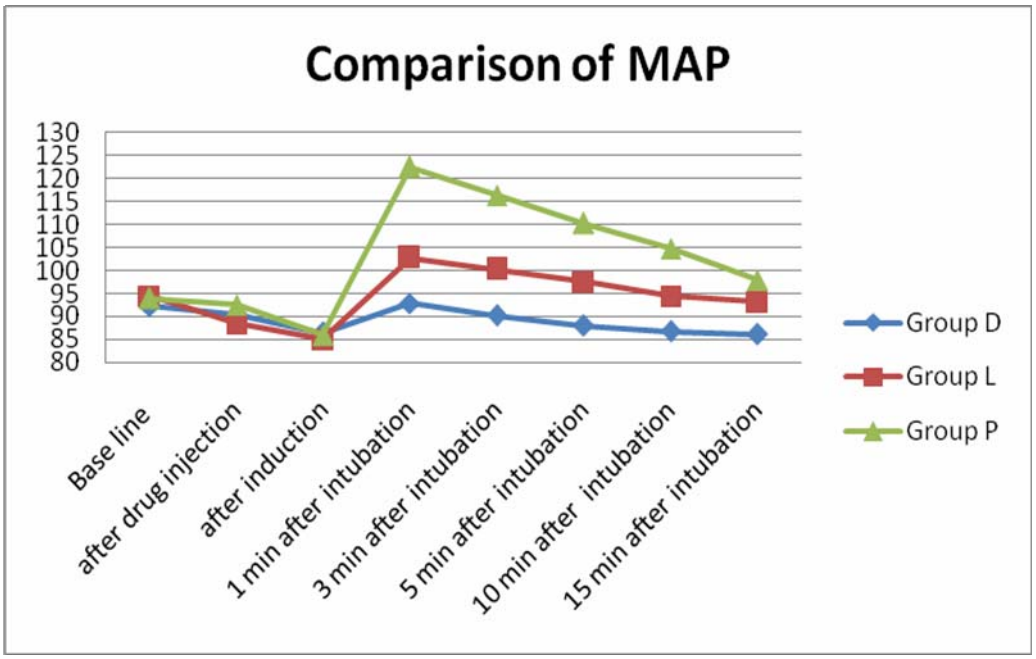


TABLE – 10

COMPARISON MAP GROUP DAND GROUP L

Heart rate Mean±sd	**GROUP D**	**GROUP L**	**'P'Value**
Baseline	92.17± 6.3	94.4 ±7.3	0.379
After drug	90.43±7.4	88.5±6.7	0.501
After induction	86.47±6.7	85.1±6.6	0.686
After intubation 1min	92.87 ±5.5	102.7± 6.6	0.001
3 min	90 ±4.8	100 ±6.6	0.001
5 min	88.1± 4.6	97.6± 6.3	0.001
10 min	86.73 ±3.9	94.4 ±5.2	0.001
15 min	86.13 ±3.8	93.2± 5.5	0.001

SD- Standard deviation **'P'**<0.05-Significant

SAP, DAP and MAP after injection of drug and after induction were comparable between the groups. There is no statistically significant difference('p'>0.05).

After laryngoscopy and intubation SAP,DAP and MAP increased at 1min, 3min, 5min.10min and 15 min in group P compared to group D and group L ('P'<0.05).

In group D the pressures after intubation at 1min,3min, 5min, 10min and 15 min intervals were less than group L.

Airway scoring; MMS and CLG were comparable between the groups

TABLE – 11

MODIFIED MALLAMPATTI CLASSIFICATION

	MPC I	**MPC II**
GroupD	24	6
Group L	24	6
Group P	26	4

FIGURE - 10

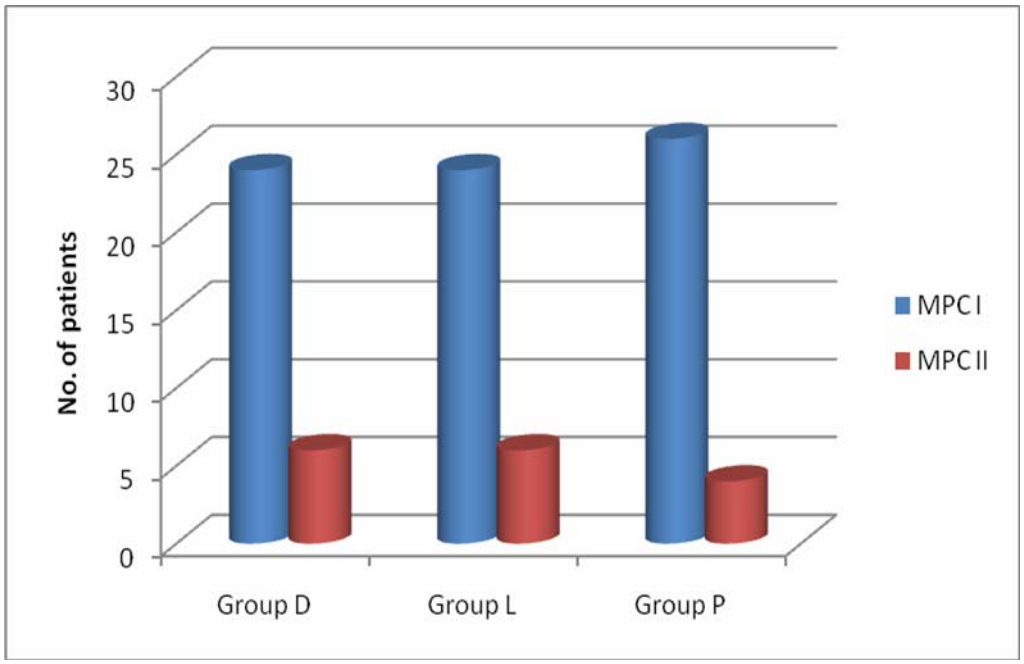


TABLE – 12

CORMACK-LEHNE SCORING

	CLG I	CLG II a
Group D	22	8
Group L	25	5
Group P	20	9

FIGURE - 11

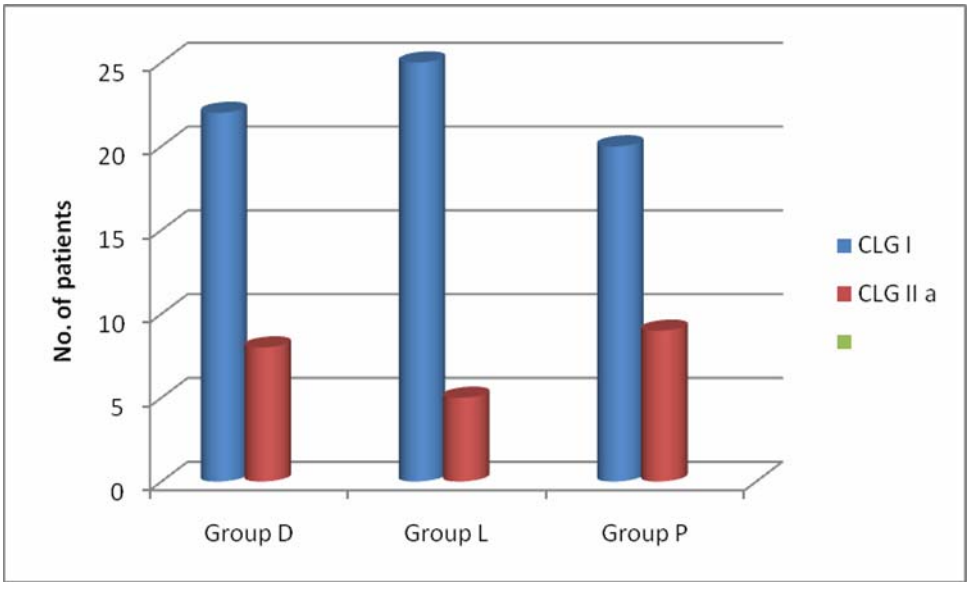


FIGURE - 12

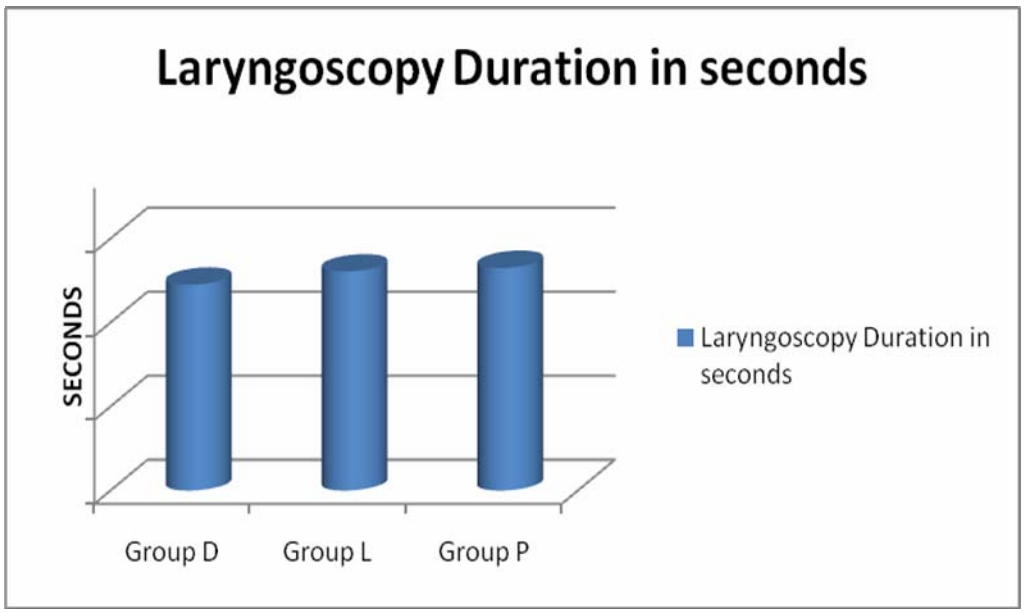


TABLE - 13

INCIDENCE OF COMPLICATIONS

	Group D	**Group L**	**Group P**
Hypotension	Nil	Nil	Nil
Bradycardia	Nil	Nil	Nil

DISCUSSION

Larngoscopy and endotracheal intubation frequently induce a cardiovascular stress response characterized by hypertension and tachycardia. This sympathoadrenal stress response to laryngoscopy results in an increase in myocardial O2 demand leading to ischemia and acute heart failure in susceptible individuals.

In view of the frequent occurrence of hypertension and tachycardia during laryngoscopy even in normotensive individuals, it is perhaps rather surprising that complications have not been met very often. One reason for this may be the transient nature of hypertension which usually lasts less than 10 minutes. It is possible however that some of the complications that occur during intubation or even later in the course of anaesthesia may be precipitated by an episode of hypertension and tachycardia, following endotracheal intubation. ELLIOF (1980) observed left ventricular wall dysfunction following endotracheal intubation.

This reflex sympathetic response may be diminished or modified locally, centrally and peripherally and attempts have been made to accomplish this using all these approaches with varying success.

In an attempt to blunt these potentially adverse haemodynamic responses, different techniques and agents were used by many with varying success.

Sympathetic system activation plays main role for the occurrence of transient but significant tachycardia and hypertension during intubation. Since any drug that antagonizes the Sympathetic system activation will attenuate these effects.

STEINHAN and GASKIN (1963) used intravenous lignocaine, JAMES et al (1981) used lignocaine intratracheal spray, MASSON AND ECKANGOFF (1971) and DENLINGER J.K. (1974) and STOELTING (1978) used a combination of viscous lignocaine and topical intratracheal lignocaine and in 1979 LEAKO used a bolus of Sodium nitroprusside.

J.CURRAN et al (1980) tried droperidol, A.J.COLE and C.JORDAN (1980) and RICHARD et al (1981) studied the effect of β blockers using metaprolol and propranolol respectively. LUNN (1979) BENNET and STANLEY (1980) and DONAL E.MARTIN (1982) studied the effect of fentanyl in attenuating the intubation stress response.

SARVESH P. SINGH, ABDUL QUADIR compared the efficacy of esmolol and labetalol, in low doses, for attenuation of sympathomimetic response to laryngoscopy and intubation

Inhalation agents when used required deep levels and may delay recovery after short surgeries and can cause cardio vascular depression

Use of Vasodilators like Sodium nitroprusside results in reflex tachycardia, lability in blood pressure, cerebral vasodilation with elevation of

intracranial pressure and pulmonary venous admixture Opiod analgesics will attenuate the hemodynamics at the expense of respiratory depression.

The α_2 receptors are involved in regulating the autonomic and cardiovascular systems. α_2 receptors are located on blood vessels, where they mediate vasoconstriction, and on sympathetic terminals where they inhibit norepinephrine release. α_2 receptors are also located within the central nervous system and their activation leads to sedation, a reduction of tonic levels of sympathetic outflow and an augmentation of cardiac-vagal activity. This can result in a decrease in heart rate and αcardiac output.

The use of α_2 agonists in the perioperative period has been associated with reduced anesthetic requirements and attenuated heart rate and blood pressure responses to stressfull events. In addition,α_2 receptors within the spinal cord modulate pain pathways, thereby providing some degree of analgesia.

Dexmedetomidine compared to Clonidine is a much more selective alpha2-adrenoceptor agonist, which might permit its application in relatively high doses for sedation and analgesia without the unwanted vascular effects from activation of alpha1-receptors. In addition, Dexmedetomidine is shorter-acting drug than clonidine and has a reversal drug for its sedative effect, Atipamezole. These properties render Dexmedetomidine suitable for sedation and analgesia during the whole perioperative period: as premedication, as an anesthetic adjunct for general and regional anesthesia, and as postoperative sedative and analgesic.

It was observed that dexmedetomidine used in premedication supresses the sympathetic activation which is due to the endotracheal intubation. Dexmeditomidine reduces the opioid requirement resulted in faster recovery

It was observed that dexmedetomidine used in premedication supresses the sympathetic activation which is due to the endotracheal intubation. Güler et al. found that the increase in blood pressure and heart rate during the extubation is decreased and the quality of extubation is increased by dexmedetomidine

Labetalol is an adrenergic receptor blocking agent with mild alpha1- and predominant beta-adrenergic receptor blocking actions (alpha:beta blockade ratio of 1:7 for iv and 1:3 for PO administration). The onset of action of i.v. labetalol is 5 min.

Labetalol has the following advantages over other beta blockers

1. Decrease SVR leading to decrease in BP is by alpha -1 blockade
2. Vasodilation also produced by partial B2 agonist activity
3. Reflex tachycardia due to peripheral vasodilation is attenuated by B blockade
4. Cardiac output remains unchanged
5. Presynaptic alpha-2 receptors are spared- hence release of Norepinephrine is intact, which inhibits further release of catecholamine (Neg feedback mech)

In our study we used Dexmeditomidine 1μ/kg and labetalol 0.5mg/kg and compared with placebo. Both the drugs produce peak effect after 5 minutes. We had induced all the patients 5 minutes after preinjection.

In some patients dexmeditomidine resulted in minimal increase in arterial pressure. This transient hypertension is due to $\alpha_1$mediated vasoconstriction. This transient hypertension is less than that seen with clonidine since dexmeditomidine has more selectivity over α_2 receptors.

Giving the loading dose over 20 minutes also minimizes the transient hypertension.[34]

Bradycardia after dexmeditomidine was reported in some studies with the bolus injection. Scheinin et al reported that the use ofα_2 agonist leads to bradycardia.[35]

In our study dexmeditomidine over 10 min with continuous monitoring of heart rate, none of the patients developed bradycardia that required atropine.(table-3,13)

Dexmeditomidine over 10 min with continuous monitoring of arterial oxygen saturation with pulse oxymeter showed no desaturation (spo2-<95%) in any patient.

Ebert et al. didn't observe any apnea, airway obstruction and hypoxemia with bolus doses of dexmedetomidine in their study and they reported that depression of respiration may be seen due to deep sedation[36]

In another study in which the infusion of opioid andα_2 adrenergic agonists were compared, it was concluded that dexmedetomidine doesn't cause significant respiratary depression and it decreases the risk of apnea . Hofer et al reported that dexmedetomidine seems to be a good choice in the critical patients in whom ventilation can be depressed with narcotics.[37]

Labetalol in a dose of 0.5mg/kg had reduced the heart rate. But the reduction was modest compared to dexmeditomidine (table-3) the reduction in arterial pressure after labetalol was mild (table-9) that was statistically insignificant.

Heart rate increase and arterial pressure reduction after induction was minimal in all 3 groups and there was no statistically significant difference between the groups. There was no significant hypotension on induction with dexmeditomidine or labetalol compared to placebo. ($P>0.05$ table-9)

After intubation the blood pressure and heart rate were increased significantly in placebo group, while labetalol preinjection reduced the response significantly though there was a little rise in MAP and HR. (table-6,9)

Dexmeditomidine preinjection effectively attenuated the hemodynamic response to intubation compared to labetalol. (table-6, 10)

Sympathetic response to intubation lasted for 15 minutes. Arterial pressure and heart rate returned to baseline values in 15 minutes in placebo group. (table-6,9)

In our study all the patients remained in supine position postoperatively. No postural hypotension related side effects were reported.(side effect seen with labetalol when the patient allowed to sit with in 3 hours after injection.

Dexmeditomidine reduced the requirement of inhalational agents and opioids intraoperatively compared to placebo.

With Labetalol the hemodynamics and anesthetic requirements after30 to 45 minutes were similar to placebo group.

Extubation and recovery were comparable in all 3 groups

Bolus dose of both Dexmeditomidine and Labetalol were effective in attenuating the hemodynamic response to intubation, but the effect was complete and better with Dexmeditomidine

SUMMARY

This study was done to compare the efficacy of bolus injection of Dexmeditomidine and Labetalol in attenuating the sympathoadrenal response accompanying laryngoscopy and endotracheal intubation in 90 patients divided into 3 groups.

Group D - Dexmeditomidine 1μ/Kg

Group L - Labetalol 0.5mg/Kg

Group P –Placebo

90 ASA I and II patients aged15– 60 years undergoing elective ENT surgeries (mastoidectomy, FESS, stapedectomy and myringoplasty) under general anesthesia were chosen for the study. After obtaining ethical committee approval, the study population was chosen. Informed written consent obtained from the patient. Heartrate, systolic and diastolic blood pressure and oxygen saturation were recorded as base line value.

All patients were monitored with ECG, pulse oximetry continuously and NIBP at 5 min intervals. Patients received study drug 5 min prior to induction according to the group. SBP, DBP, MAP, HR and SpO2 were monitored 1 minute after infusion of study drug, 1minute after induction and 1,3,5,10 and15 minutes after intubation.

Results were tabulated and analysed. We used Chi-Square test, and ANOVA and Post-Hoc test as appropriate. $p<0,05$ was considered statistically significant. The results were presented as means and SD

With patients matched for demographic data the results showed there was no significant difference in base line values between three groups.

There was a reduction in the heart rate and mean arterial pressure response to intubation in both Dexmeditomidine and Labetalol groups compared with placebo ($P<0.05$), but when both the groups were compared there was statistically significant reduction of heart rate and arterial pressure response to intubation in Dexmeditomidine group. ($P < 0.05$).

There were no significant hypotension or bradycardia in any of the groups.

CONCLUSION

We conclude that, Dexmeditomidine 1μ/Kg given slowly over 10 minutes intravenously 5 minutes prior to induction, attenuates the cardiovascular responses to laryngoscopy and intubation in a better manner than Labetalol 0.5mg/Kg.

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PROFORMA

A COMPARATIVE STUDY OF DEXMEDETOMIDINE AND LABETALOL FOR ATTENUATION OF HAEMODYNAMIC STRESS RESPONSE TO LARYNGOSCOPY AND INTUBATION

Name: Age: Sex: Wt: kg

Date : I.P. no: ASA:

Diagnosis: surgery planned:

History :

Investigations :

Hb%: Blood sugar:

ECG Urea:

Chest X ray Creatinine:

O/E

Anaemia: CVS; RS:

PR: BP:

Pre-med : Inj. Midazolam 2mgi.m

Inj. Glycopyrrolate 0.2mg i.m. 45 min prior to surgery

Group D - Dexmedetomidine 1 µg/kg in 10ml normal saline i.v. over 10 min 5min before induction of anaesthesia

Group L - Labetalol 0.5mg/kgin 10ml normal saline i.v. over 10min, 5min before induction of anaesthesia

Group P - 10ml normal saline i.v. over 10min, 5min before induction of anaesthesia

Induction :Inj Fentanyl 2 mcg/kg,

Inj.thiopentone 5mg/kg,

Inj.veccuronium 0.08 mg/kg

Airway : ETT

Maintenance : O_2 / N_2O / Isoflurane

Parameters Monitored:

Laryngoscopy duration: in seconds

Cormack lehane grade: I / II/ III/ IV

Time in min	Haemodynamic variables				
	HR	SBP	DBP	MAP	SpO_2
Baseline					
1 min after study drug					
1min after induction					
1 min after intubation					
3min					
5min					
10min					
15min					

Side effects : Hypo tension / bradycardia / bronchospasm

S.NO	Name	Age	kg	Baseline					min after injection of study dru					1min after induction					After intubation 1min				
	DEXMED GROUP			SBP	DBP	MAP	PR	SPO2	SBP	DBP	MAP	PR	SPO2	SBP	DBP	MAP	PR	SPO2	SBP	DBP	MAP	PR	SPO2
1	Babu	28/M	68	124	72	89	84	99	124	78	93	66	99	106	61	76	72	99	121	79	93	82	100
2	Nagaraj	45/M	71	134	82	99	78	98	119	74	89	65	98	108	67	79	68	100	131	79	96	72	100
3	Sarathkumar	18/M	65	126	86	99	75	99	119	69	86	61	99	110	61	87	71	100	128	81	97	73	100
4	Saraswathy	32/F	52	118	78	91	90	100	110	68	82	67	99	105	72	83	78	99	117	78	91	84	100
5	Premkumar	22/M	55	110	69	83	89	99	102	60	74	69	98	95	56	69	81	100	114	68	83	82	100
6	Zubi	15/F	50	130	71	91	93	99	122	72	89	79	99	121	73	88	82	100	128	78	95	88	100
7	Thasin	23/F	47	115	79	91	81	99	118	85	93	64	98	115	80	93	74	99	116	81	93	72	99
8	Wiilliams	39/M	70	108	77	87	107	99	107	78	88	76	98	105	77	87	75	100	110	79	89	79	100
9	Ponraj	21/M	56	111	83	92	84	98	102	71	81	66	97	105	75	85	74	100	115	85	95	82	100
10	Anand	32/M	58	115	78	91	84	98	121	88	99	64	98	114	78	90	72	100	120	79	92	78	100
11	Anandhi	16/F	45	108	76	87	99	99	109	79	89	70	98	101	71	81	77	99	109	81	91	77	100
12	Viji	27/F	65	116	88	98	89	99	121	88	99	65	99	115	86	95	72	100	120	89	99	76	100
13	Anand	24/M	59	121	82	95	83	99	122	81	94	65	98	123	81	97	77	100	123	83	99	80	100
14	Rajiv gandhi	27/M	75	117	74	88	88	98	117	76	90	61	98	114	72	86	71	99	121	76	91	71	100
15	Balan	22/M	69	118	73	88	98	98	119	73	87	71	98	118	72	87	74	99	118	80	93	74	99
16	Raja	26/M	59	125	88	100	87	99	109	73	85	74	99	107	66	79	81	100	108	74	85	78	100
17	Shanmugavalli	55/F	47	123	84	95	87	99	123	69	87	63	99	115	73	87	69	100	119	81	94	66	100
18	Raman	48/M	56	123	87	99	79	100	129	88	102	67	100	121	81	91	71	100	118	86	97	69	100
19	Suresh	20/M	61	119	76	90	67	100	126	75	92	58	99	117	73	88	68	99	119	73	88	69	99
20	Amudha	30/M	49	129	86	100	99	99	125	85	99	73	98	124	83	97	79	100	128	91	103	83	100
21	Valli	29/F	57	124	87	98	80	99	118	68	85	70	99	113	72	86	77	99	128	91	104	78	100
22	Pushpavalli	42/F	70	126	86	99	88	99	131	86	101	72	99	124	81	95	70	100	124	89	101	82	100
23	Srinivasan	26/M	60	108	73	85	78	98	108	77	87	62	99	103	72	82	69	99	106	75	85	78	100
24	Rani	26/F	39	105	71	82	89	100	96	73	81	61	100	93	70	78	75	100	105	71	82	84	100
25	Xavier	41/M	56	112	64	80	76	100	118	65	83	61	99	110	64	79	70	99	117	77	90	76	99
26	Gopi	30/M	59	132	84	100	88	99	136	89	105	64	99	123	79	94	71	100	128	79	95	78	100
27	Martin	40/M	73	128	86	100	69	100	134	88	103	58	99	125	79	94	71	100	124	81	95	69	100
28	Prabavalli	43/F	43	103	76	85	89	99	112	76	88	62	99	107	71	83	71	100	108	79	88	69	100
29	Veeramuthu	23/M	68	115	70	85	83	100	121	73	89	63	99	116	73	87	67	99	116	74	88	72	100
30	Indhiragandhi	65/F	44	136	79	98	73	99	124	77	93	59	100	119	77	91	71	99	129	77	94	71	100

3min					5 min					10 min					15 min					MMS	CLG	Duration of laryngoscopy	ASA
SBP	DBP	MAP	PR	SPO2	SBP	DBP	MAP	PR	SPO2	SBP	DBP	MAP	PR	SPO2	SBP	DBP	MAP	PR	SPO2				
124	76	92	85	99	119	72	87	86	99	120	71	87	78	99	124	74	91	72	100	I	I	17	I
134	79	97	78	100	131	81	98	76	100	129	72	91	74	100	123	73	90	69	99	I	I	13	I
125	79	98	68	100	121	74	90	66	100	120	71	87	65	100	120	70	87	66	100	I	I	15	I
117	75	89	88	100	115	75	88	86	100	110	74	86	80	100	114	72	85	79	100	I	I	16	I
111	68	82	77	100	110	67	81	71	100	108	70	83	70	100	111	73	86	75	100	I	I	12	II
125	75	92	79	100	118	73	88	78	99	115	73	86	73	100	113	69	84	73	100	II	IIA	17	I
116	82	93	71	100	116	82	93	70	100	116	82	93	71	100	117	82	93	69	100	I	I	15	I
107	77	87	77	100	105	77	86	79	100	105	76	86	78	100	104	75	85	79	100	I	IIA	18	I
106	76	88	80	100	102	76	85	76	100	102	76	85	74	100	102	74	83	74	100	II	I	14	I
119	75	90	70	100	120	74	89	72	100	110	70	89	70	100	105	74	84	70	99	I	I	17	I
111	81	91	72	99	109	79	91	70	100	102	74	83	72	100	105	75	85	70	100	I	IIA	16	I
121	85	96	70	100	115	70	85	74	100	114	74	87	71	100	112	71	84	73	100	I	I	14	I
117	74	88	81	100	117	74	88	81	100	109	77	88	76	100	108	77	88	71	100	II	IIA	17	II
118	71	87	71	100	114	70	85	70	100	112	70	84	71	100	112	71	85	70	100	II	I	15	II
116	72	87	73	100	114	71	85	68	100	112	73	86	69	100	111	70	84	70	100	I	IIA	16	I
103	70	81	76	100	104	71	82	73	99	103	72	83	70	99	102	71	83	71	100	I	I	14	I
118	81	93	66	100	113	78	90	61	100	112	72	86	60	100	114	74	87	67	100	I	IIA	15	I
115	83	94	68	100	115	79	91	65	100	114	79	91	68	100	114	78	90	67	100	I	I	12	I
118	73	88	68	99	116	77	90	69	100	106	72	84	60	100	109	71	84	60	100	I	I	14	I
129	89	101	78	100	127	85	99	69	100	119	81	96	70	100	119	80	95	70	100	I	I	12	I
124	83	97	72	99	122	80	93	71	100	117	72	86	71	100	115	72	85	68	99	I	I	13	I
116	73	87	82	100	114	73	87	81	99	114	73	87	81	100	119	73	88	80	100	II	I	14	1
106	76	86	79	100	99	69	79	69	100	96	73	81	76	100	99	68	79	76	99	I	I	12	I
106	74	85	78	100	99	70	80	73	100	96	66	76	70	99	98	67	77	70	100	I	I	13	I
112	72	85	69	99	112	72	85	69	100	113	72	85	69	100	113	73	86	71	100	I	I	17	I
121	78	92	76	100	121	76	91	71	100	122	74	90	69	100	118	76	89	70	100	I	IIA	16	I
125	80	95	69	100	121	79	92	68	100	118	80	93	67	100	117	78	91	68	100	I	I	13	I
108	75	86	70	100	106	75	85	69	100	107	74	85	69	100	107	74	85	68	100	I	I	14	I
113	74	87	73	99	114	74	87	72	100	114	74	87	70	100	110	70	83	70	100	I	I	14	I
127	76	93	68	99	126	75	92	72	100	123	75	91	70	100	119	73	88	69	100	II	IIA	19	II

S.NO	Name	Age	kg	Baseline					1min after injection of study drug					1min after induction					After intubation 1min					
	labetalol group			SBP	DBP	MAP	PR	SPO2	SBP	DBP	MAP	PR	SPO2	SBP	DBP	MAP	PR	SPO2	SBP	DBP	MAP	PR	SPO2	SBP
1	Shanthi	48/F	54	126	84	97	94	99	126	82	97	89	99	114	70	85	92	100	138	90	106	98	100	136
2	Praveenkumar	15/M	47	116	76	89	98	99	110	70	83	79	99	109	73	85	88	100	132	89	104	90	100	129
3	Antony	15/M	51	109	77	90	99	98	100	70	80	77	99	96	73	81	83	100	129	85	100	99	99	123
4	Marikannan	27/M	67	115	74	88	78	99	112	79	83	82	100	104	72	83	82	100	134	89	104	90	100	124
5	Ruckmani	41/F	59	139	92	104	93	99	112	72	86	78	100	100	68	79	83	100	131	91	104	74	100	132
6	Sasikumar	22/M	70	136	90	105	93	100	132	88	103	82	99	132	88	103	87	99	131	93	106	99	100	131
7	Aadhilakshmi	40/F	55	114	84	94	104	99	109	82	91	96	100	97	69	78	98	100	103	74	84	103	100	104
8	Gangalakshmi	40/F	69	116	75	89	89	99	108	66	80	78	100	102	69	80	93	100	130	87	101	105	100	119
9	Nithya	15/F	43	115	76	89	110	99	111	73	85	102	99	108	70	83	104	99	118	78	91	103	100	113
10	Narasimma moorthy	46/M	78	120	80	93	82	99	112	76	88	76	100	110	70	83	84	100	138	92	107	101	100	132
11	Elango	18/M	62	114	87	96	91	99	110	78	89	78	100	107	79	87	89	100	131	89	103	99	100	129
12	Ramesh	15/M	59	114	81	92	94	98	112	80	91	78	100	108	74	85	84	100	134	89	104	102	100	131
13	Jeevitha	15/F	55	108	73	85	97	99	101	71	81	79	99	96	70	79	82	100	129	83	98	110	100	126
14	Perumal	46/M	65	131	88	102	88	98	117	78	89	70	100	117	86	96	82	100	137	96	110	88	100	132
15	Jeya	20/F	50	110	75	87	90	99	107	71	83	83	100	103	73	83	82	100	128	85	99	96	100	127
16	Chinnaraj	45/M	68	130	88	102	72	99	105	70	82	70	99	108	70	83	83	100	128	99	109	122	99	128
17	Jeyaraman	61/M	60	141	81	101	71	100	114	78	90	60	99	112	75	87	74	100	148	92	111	88	100	141
18	Parvathy	40/F	39	139	93	108	81	100	128	87	101	71	100	121	85	97	79	100	146	95	112	91	100	141
19	Selvi	20/F	38	108	78	88	97	99	100	71	81	72	100	94	72	79	82	100	134	88	113	102	100	124
20	Perumal	55/M	59	139	89	104	92	99	126	82	97	76	100	114	70	85	82	99	139	96	110	103	100	136
21	Raj	36/M	60	127	86	100	99	98	114	81	92	79	99	112	81	90	82	100	130	91	104	111	100	127
20	Irulammal	38/F	56	119	81	94	73	99	112	83	93	66	100	110	80	90	87	99	128	91	104	91	100	123
23	Muralidharan	41/M	61	129	83	98	89	99	125	84	98	74	99	117	80	92	84	100	132	89	103	93	100	131
24	Sathish	27/M	71	118	73	88	76	99	112	70	84	70	100	110	67	79	78	100	130	80	97	86	100	126
25	Kalyani	46/F	56	125	75	91	71	99	112	72	85	63	99	110	70	83	71	100	131	82	98	80	100	125
26	Mani	16/M	49	110	68	82	96	99	110	64	79	88	100	110	60	73	88	100	126	80	95	98	99	126
27	Mohudheen	46/M	57	140	93	109	74	100	124	85	98	71	99	120	84	96	72	100	151	95	112	79	100	149
28	Saradha bai	65/F	65	119	82	94	77	99	118	80	93	71	100	115	72	86	78	100	129	83	98	79	100	126
29	Mariammal	51/F	58	112	78	89	89	99	109	82	91	76	100	112	70	82	82	100	121	86	98	87	100	120
30	Revathy	26/F	61	107	76	86	86	99	103	76	83	69	100	100	70	80	71	99	117	85	96	88	100	119

3min				5 min					10 min					15 min					MMS	CLG	Duration of laryngoscopy	ASA
DBP	MAP	PR	SPO2	SBP	DBP	MAP	PR	SPO2	SBP	DBP	MAP	PR	SPO2	SBP	DBP	MAP	PR	SPO2			Sec	
92	107	96	99	129	89	102	92	100	124	85	98	90	100	116	76	89	79	100	II	I	14	I
87	101	86	100	128	87	101	87	100	125	84	98	84	100	119	79	93	86	99	I	I	17	I
82	96	96	100	124	81	95	91	100	119	79	92	87	100	110	76	87	83	100	I	I	18	I
88	100	84	100	120	85	97	80	100	122	87	99	78	100	115	81	92	78	100	I	I	15	I
90	104	76	100	135	90	105	72	100	134	88	103	72	100	137	84	102	72	99	II	IIA	19	I
93	106	94	100	132	93	106	91	100	123	83	96	86	100	124	84	97	87	99	I	I	12	I
73	82	94	100	100	77	85	96	100	101	76	84	92	99	117	87	97	91	100	I	I	8	I
77	91	91	100	115	74	88	90	100	115	74	88	90	100	109	74	86	93	100	I	I	14	I
75	88	106	100	114	72	85	102	100	114	72	86	100	100	111	69	83	100	99	I	I	9	I
89	103	100	100	130	89	102	94	100	124	78	93	91	100	121	84	96	79	100	II	I	12	I
88	101	96	99	129	85	100	91	100	124	81	95	88	100	121	78	92	81	100	I	I	14	I
85	101	96	100	127	84	98	92	100	125	80	95	82	100	121	74	83	80	100	I	I	12	I
83	97	106	100	121	80	94	100	100	111	77	90	92	100	110	75	87	92	99	I	I	21	I
95	107	85	100	134	95	106	75	99	123	78	93	78	100	112	77	89	75	100	II	I	17	I
89	100	94	100	114	81	92	81	100	112	80	90	72	99	114	80	90	71	100	II	I	12	I
99	109	121	100	133	90	104	107	100	127	88	101	94	100	121	87	97	90	99	I	IIA	20	I
91	108	87	100	138	91	107	81	100	130	82	99	82	100	132	81	98	83	100	II	IIA	21	II
92	108	88	100	129	90	103	82	100	131	88	102	80	100	130	88	102	76	99	I	IIA	21	I
87	99	98	100	126	87	100	93	100	121	81	94	84	100	117	82	95	81	99	I	I	13	I
92	107	94	100	129	92	104	90	100	131	82	99	74	100	127	84	98	70	100	i	IIA	19	I
92	104	103	100	126	86	99	94	99	121	82	96	92	100	123	84	97	89	100	I	I	14	I
84	97	81	100	119	80	93	80	100	119	78	88	80	100	119	79	89	80	100	I	I	15	I
87	102	88	99	129	87	100	83	100	128	85	99	82	100	128	84	99	83	100	I	I	16	I
83	97	83	100	123	80	93	78	100	121	78	92	78	100	120	77	91	78	100	I	I	17	I
79	94	78	100	123	77	92	76	100	121	77	91	74	99	120	75	90	76	100	I	I	17	I
82	97	101	100	123	77	92	91	100	120	76	91	84	100	118	76	90	84	100	I	I	12	I
94	112	77	100	139	87	104	77	100	137	88	104	75	100	137	87	104	77	99	I	I	15	I
81	97	73	100	125	82	96	75	100	127	83	97	77	100	123	82	95	75	100	I	I	14	I
83	95	78	100	118	77	91	78	100	118	79	92	76	100	119	77	91	75	100	I	I	17	I
85	96	85	100	117	81	93	78	99	110	75	87	77	99	116	73	97	74	100	I	I	18	I

S.NO	Name	Agex/se	Wt(kg)	Baseline					1min after injection of study drug					1min after induction					After intubation 1min				
	NORMAL SALINE			SBP	DBP	MAP	PR	SPO2	SBP	DBP	MAP	PR	SPO2	SBP	DBP	MAP	PR	SPO2	SBP	DBP	MAP	PR	SPO2
1	Ruckmani	45/F	51	132	82	98	88	99	130	80	96	82	99	110	73	83	86	99	159	101	120	112	99
2	Padmawathy	30/F	47	100	70	80	92	99	104	69	81	90	99	92	64	73	96	100	130	92	105	114	100
3	Rajeshwari	40/F	51	124	84	97	88	98	121	85	97	82	98	104	74	79	92	100	147	99	115	114	100
4	Shalini	28/F	44	116	74	89	72	99	114	77	89	74	99	109	71	82	82	100	171	108	129	102	100
5	Mariammal	23/F	56	129	82	98	100	99	126	80	95	97	99	118	75	89	102	100	169	118	131	138	100
6	Vadivel	55/M	68	110	70	83	64	100	107	72	84	67	100	94	62	73	74	100	151	100	117	96	100
7	Priya	16/F	49	130	78	95	87	99	128	78	94	85	99	124	75	92	92	100	150	101	118	118	100
8	Kowsalya	34/F	55	121	86	98	84	98	118	82	94	76	99	108	80	89	76	100	165	126	139	118	100
9	Jeyanthi	37/F	49	130	90	103	91	99	127	88	101	87	99	118	80	93	97	100	160	119	133	132	99
10	Srinivasan	22/M	67	135	85	102	74	100	131	82	98	72	99	116	75	88	85	100	162	110	126	108	100
11	Kousi begam	16/F	43	121	81	94	71	99	118	79	92	79	99	113	71	85	88	99	154	114	127	119	100
12	Santhosh	21/M	62	118	76	89	78	98	115	73	87	72	98	109	72	84	81	100	139	90	106	119	100
13	Annalakshmi	33/F	57	114	82	93	82	99	116	84	95	89	99	110	82	91	94	100	135	99	111	102	100
14	Sasikumar	22/F	65	114	74	87	67	99	112	72	85	65	98	107	67	80	75	100	149	109	123	101	100
15	Vijaya	44/F	49	141	84	103	88	99	131	83	99	88	99	125	78	99	91	100	155	96	116	104	100
16	Raju	26/M	71	129	86	100	75	99	127	84	98	77	99	124	80	95	85	100	149	107	121	131	100
17	Gunalan	43/M	67	121	84	98	61	98	120	85	97	67	100	114	82	93	81	100	154	110	125	98	100
18	Sathish kumar	18/M	75	107	72	82	110	100	106	72	83	101	100	96	70	79	108	100	139	96	121	134	100
19	Sathya	19/F	49	117	84	95	73	100	115	82	95	75	99	103	74	84	73	100	158	109	128	101	100
20	Kumar	30/M	59	124	82	96	79	100	120	82	95	75	99	117	80	92	87	100	157	109	125	129	99
21	Anjalai	48/F	48	131	84	100	67	99	127	82	91	71	98	121	76	91	82	99	161	112	128	92	100
22	Aadhilakshmi	40/F	51	127	74	92	72	99	125	72	89	77	99	117	65	82	83	100	151	109	123	112	100
23	Devi	33/F	63	125	81	95	88	99	121	79	93	74	99	114	72	82	79	99	156	110	125	99	100
24	Sarala	29/F	41	117	84	95	91	99	114	82	92	79	99	110	79	89	85	100	154	107	123	128	99
25	Usha	19//F	51	121	81	94	88	98	118	79	92	82	99	103	71	81	87	100	154	114	127	117	100
26	Fathima	29/F	58	117	74	85	86	100	115	76	89	77	99	107	69	82	87	100	147	109	122	121	100
27	Chinnakannu	52/M	59	120	84	96	87	100	131	85	100	85	100	120	74	89	88	100	160	118	132	135	100
28	Kannan	35/M	61	124	81	95	88	99	127	79	94	84	99	124	74	91	90	100	144	106	119	112	100
29	Parthasarathy	57/M	71	127	88	101	71	99	125	83	97	76	99	114	76	89	79	100	159	113	128	99	100
30	Loganathan	43/M	68	109	74	85	92	99	106	74	85	90	99	99	72	81	96	100	141	98	112	114	100

3min					5 min					10 min					15 min					MMS	CLG	Duration of laryngoscopy	ASA
SBP	DBP	MAP	PR	SPO2	SBP	DBP	MAP	PR	SPO2	SBP	DBP	MAP	PR	SPO2	SBP	DBP	MAP	PR	SPO2	I	I	11	I
142	100	113	104	100	133	94	106	93	100	130	90	103	90	100	127	89	100	90	100	I	IIA	13	I
124	86	99	106	100	120	80	93	100	100	116	74	87	92	100	114	72	86	90	100	II	IIA	15	I
141	96	111	113	99	134	90	105	110	100	134	84	100	90	100	132	84	98	89	100	I	I	13	I
164	108	127	99	100	144	94	110	96	99	129	90	114	93	99	118	75	89	84	100	III	IIA	13	I
158	107	124	130	100	150	101	117	120	100	134	94	107	113	100	124	87	99	106	100	I	I	16	I
139	90	103	92	100	139	90	100	84	100	121	79	93	76	100	118	70	86	70	100	I	I	14	I
143	94	110	114	99	142	93	109	112	100	135	91	106	99	100	131	82	98	91	100	I	I	13	I
152	104	120	109	100	146	101	116	103	100	137	96	110	90	100	124	87	99	82	100	I	I	14	I
144	99	113	120	100	141	96	109	114	99	137	95	107	103	100	132	87	99	92	100	I	I	13	I
157	108	124	96	100	142	95	111	86	100	139	91	107	72	100	136	88	104	71	100	I	I	14	I
146	107	120	117	100	140	100	113	105	99	134	94	107	99	100	127	84	98	91	100	I	I	15	I
136	92	107	112	100	132	87	102	104	99	125	89	98	92	100	121	79	93	85	100	I	I	14	I
131	91	104	115	100	127	86	100	112	100	121	79	93	99	100	119	81	94	92	100	I	IIA	15	I
147	106	120	98	100	142	99	113	91	99	131	90	104	87	100	130	82	98	86	100	I	I	12	I
151	92	112	100	100	144	87	106	100	99	145	84	104	97	100	140	82	101	90	100	II	IIA	21	I
142	104	117	123	100	139	101	114	112	100	129	90	103	98	100	127	90	102	90	100	I	I	16	I
151	107	122	90	100	144	106	119	86	99	135	94	108	73	100	131	89	101	74	100	I	I	14	I
136	94	108	126	100	132	89	103	110	100	129	85	100	95	100	121	74	90	96	100	I	IIA	17	I
152	106	121	99	100	149	105	118	96	100	142	97	112	87	100	130	89	102	81	100	I	I	19	I
154	107	123	117	100	149	100	116	100	100	142	97	112	91	100	134	92	106	78	100	I	IIA	19	I
154	110	125	94	100	147	106	120	89	99	142	98	113	82	100	130	90	103	83	100	I	IIA	17	I
147	106	119	103	100	142	101	114	93	100	137	94	108	88	100	131	86	101	88	100	I	I	16	I
152	108	122	95	100	144	104	117	93	100	134	94	107	89	100	128	86	100	88	100	I	I	17	I
150	102	118	109	99	142	91	108	101	99	136	84	101	92	100	124	82	96	87	100	I	I	17	I
146	107	120	104	100	140	100	113	96	100	134	94	107	94	100	127	84	98	92	99	I	I	15	I
142	106	118	112	100	134	96	108	98	99	129	90	103	88	99	121	86	97	89	100	I	I	17	I
154	108	123	124	100	142	100	114	110	100	140	94	109	99	100	136	89	105	97	100	I	I	19	II
142	102	115	110	100	134	100	111	111	99	131	99	110	106	99	127	86	100	96	100	I	I	17	I
149	108	122	93	100	144	105	118	89	100	139	99	112	82	100	130	90	103	82	100	II	I	14	I
134	97	111	116	100	134	92	106	108	100	129	84	99	102	100	121	74	91	94	100	I	IIA	19	I